THE STOCKHOLM CONFERENCE

ONLY ONE EARTH

AN INTRODUCTION TO THE POLITICS OF SURVIVAL

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The Stockholm Conference: Only One Earth

In June the UN Conference on the Human Environment convenes in Stockholm. That may be man's last chance to begin an all-out attack on the rapidly-growing environmental problems that, in the detailed analysis of the Club of Rome, seem destined otherwise to destroy our civilization within a hundred years.

Friends of the Earth, the leading conservationist group in Britain, have written this book in co-operation with the UN Conference Secretariat, to stress the scale and urgency of the problems facing the Conference – and so bring international grass-roots political pressure to bear on the delegates to do more than they now plan to do.

The book opens with a highly readable essay, illustrated with linked case-studies, on the basic principles of what makes the world work, what is going wrong, and what must be done. The ideas and language are simple enough for everyone to follow the argument. Whether those with vested interests in continuing to stretch our planet's dwindling resources will find the ideas palatable is another matter.

The second half of the book considers systematically the Conference's agenda, and offers constructive criticism of its scope and approach. The agenda is necessarily a limited one, and represents no more than a beginning.

The Stockholm Conference: **Only One Earth,** is an attempt at education, analysis, call for action, and an appeal for the working together of the nations involved; it is carefully researched, outspoken, constructive, fascinating, and essential.

The Stockholm Conference: **Only One Earth,** illustrated with powerful monochrome photographs, links in the presentation of its case, with an international television series which introduces the Conference and some of its major issues.

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THE STOCKHOLM CONFERENCE:
ONLY ONE EARTH

Ansel Adams : THE ATLANTIC, CLEARING STORM, ACADIA NATIONAL PARK

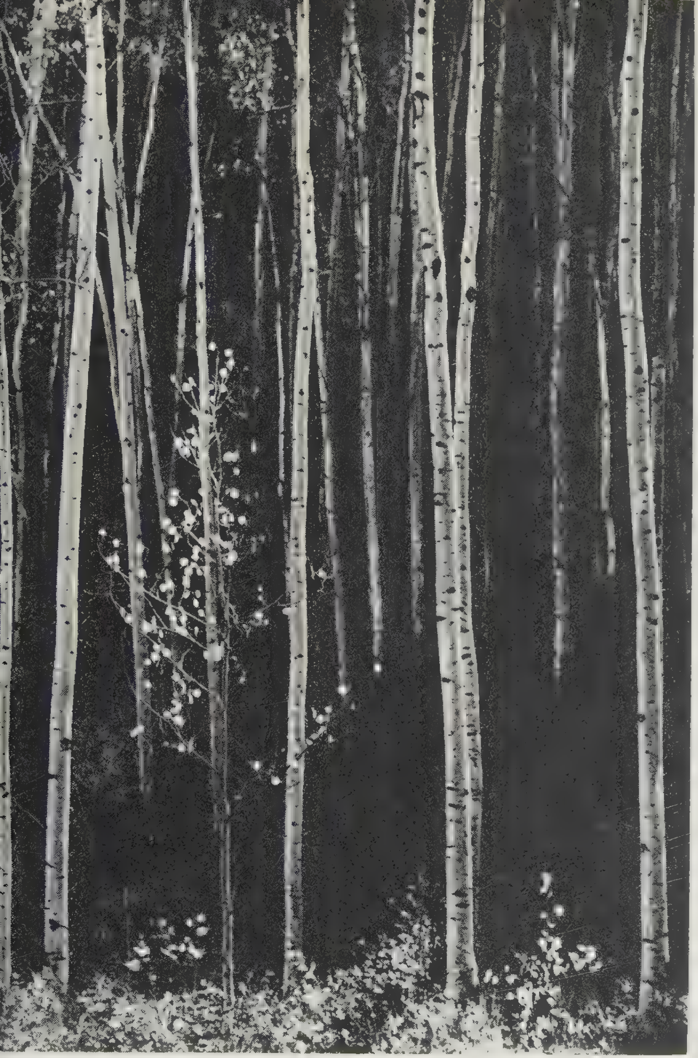
There is one ocean, with coves having many names;

a single sea of atmosphere, with no coves at all;

Edward Weston: CLOUD

Ansel Adams: FERN IN RAIN, MOUNT RAINIER NATIONAL PARK *a thin miracle of soil, alive and giving life;*

a last planet; and there is no spare.



Ansel Adams: ASPENS, NEW MEXICO (COURTESY POLAROID CORPORATION)

THE STOCKHOLM CONFERENCE:

ONLY ONE EARTH

Friends of the Earth

Ansel Adams: SIERRA NEVADA FROM LONE PINE, CALIFORNIA

An Introduction to the Politics of Survival

Earth Island London

The Stockholm Conference: Only One Earth is designed to amplify and complement the international TV co-production introducing the UN Stockholm Conference. The book is intended to tell you more about the major world issues and efforts discussed at Stockholm and examined by the TV series. But the world's environmental problems will not be solved by the Stockholm Conference; they will be with us for a very long time. Because we think these problems are important not just for the politicians and the scientists but for everyone, we have tried to keep this book accurate but popular, invaluable but inexpensive.

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David Brower is the original spring from which we have drawn much of what we have to say. In more ways than we can count, this book is more his than anyone else's.

– A.B.L. for Friends of the Earth

Only One Earth

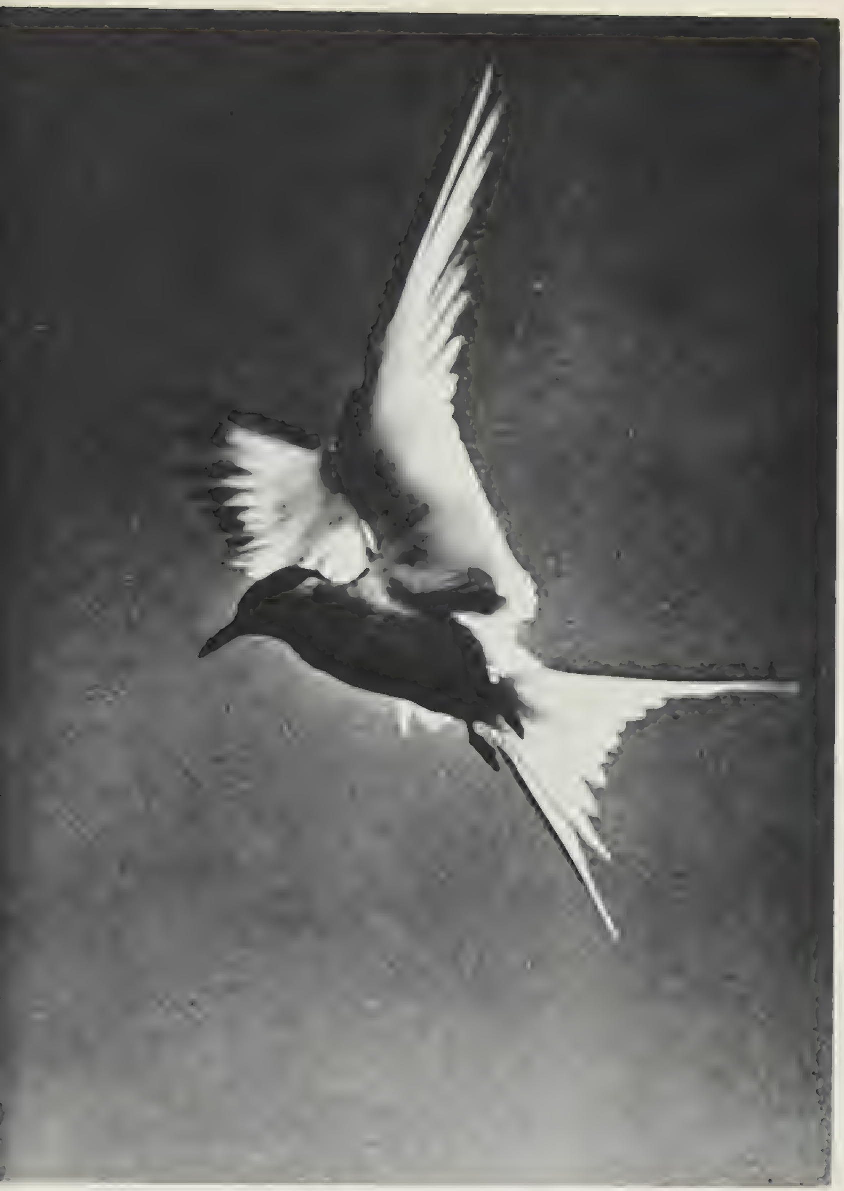
The earth is very old: more than 4,000,000,000 years old, an age we can write but not imagine. We do not know just how the earth was made. Somehow it gathered into a spinning ball. Its quivering crust slowly began to cool and take shape, a bleak and violent place. Winds of poison blew across its empty seas. But when more than 1,000,000,000 years had passed and the searing fire-tides had ebbed, the mixing of dead atoms in some strange swamp or ocean made by chance a new kind of matter: groups of atoms that could help others like themselves to form, that could break apart other groups and take their energy, that could absorb sunlight and store its energy. When the workings of time and chance brought these new kinds of matter together and linked them to each other in a great cycle driven by the sun, a new kind of chemistry was born, with such power that it swept the whole world, and gentled it, and changed it from brown to green.

Lick Observatory: TRIFID NEBULA

For the past 3,000,000,000 years, sunlight has fed the growth of this new chemistry. Very slowly, larger and more complex groups of atoms have built themselves by trial and error; different patterns of atoms have come together to make cells, and cells to make tissues, and tissues to make organs, and organs to make redwoods and bees and sharks and hawks and men: things so wonderful that we know almost nothing of how they are put together.

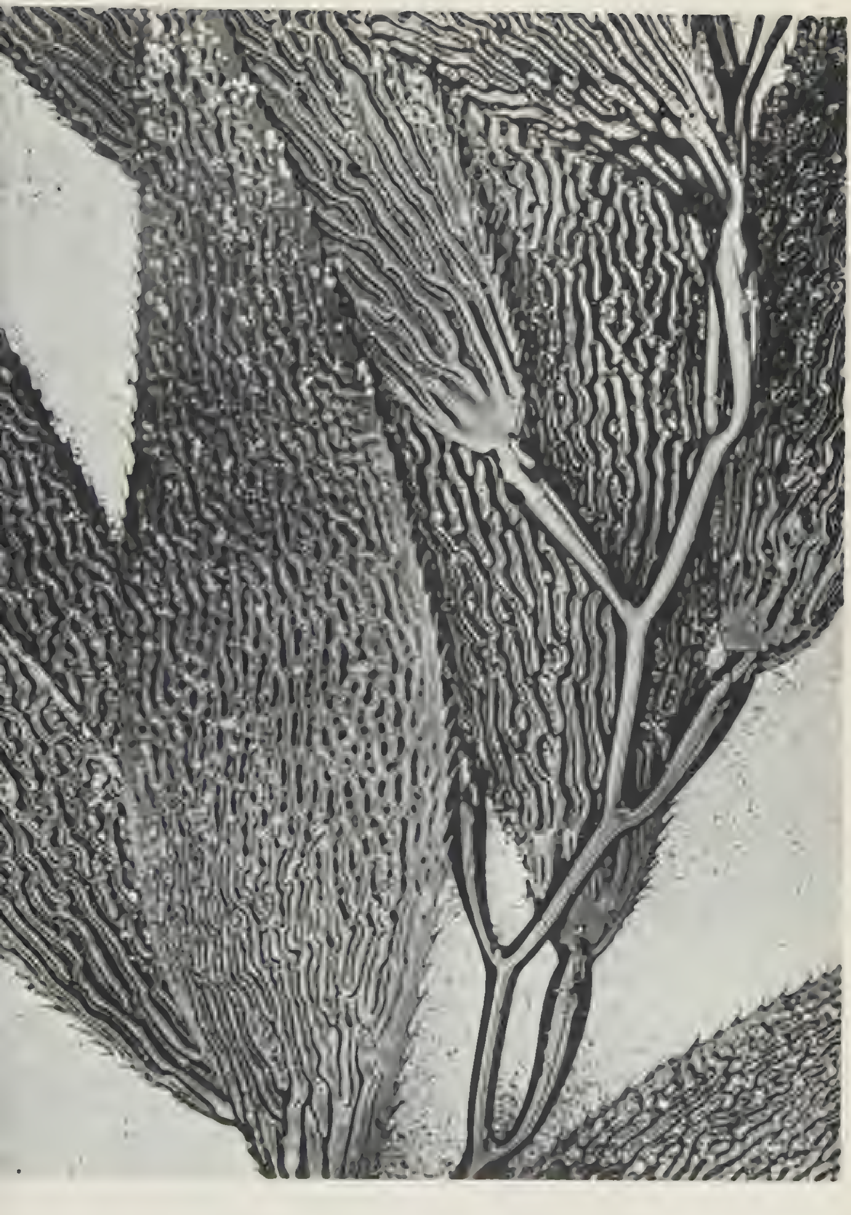
Of course, most of the ways in which atoms have happened to arrange themselves have not been good for much. The plants and animals that live today are made of the select few patterns of atoms that did work well enough to survive; and for each living thing that has survived, there have been thousands of 'mistakes' that are no longer here. By now there has been so much chance mixing of atoms that most of the ways in which groups of (say) a few hundred of them can be put together have already been tried somewhere; and most of the patterns that are not here probably are not here for a good reason – they did not work well enough for plants and animals to make more like them. Yet at the same time, this chance trying of many ways of putting atoms together is still going on: life is never still, always trying to become something else, something more efficient and stable and strong. Life changes to meet its needs: as Robinson Jeffers wrote,

What but the wolf's tooth whittled so fine
The fleet limbs of the antelope?
What but fear winged the birds, and hunger
Jewelled with such eyes the great goshawk's head?



Eliot Porter : TERN IN FLIGHT

In the midst of this ceaseless change, life holds to one central truth: that all the matter and energy needed for life moves in great closed circles from which nothing escapes and to which only the driving fire of the sun is added. Life devours itself: everything that eats is itself eaten; everything that can be eaten is eaten; every chemical that is made by life can be broken down by life; all the sunlight that can be used is used. Of all that there is on earth, nothing is taken away by life and nothing is added by life – but nearly everything is used by life, used and re-used in thousands of complex ways, moved through vast chains of plants and animals and back again to the beginning. Any break in these chains can spoil the whole. The web of life has so many threads that a few can be broken without making it all unravel (and if this were not so, life could not have survived the normal accidents of weather and time), but still the snapping of each thread makes the whole web shudder, and weakens it. Thus in the complex world of living things everything depends on everything else, all life is the same life, every effect is a cause, nothing can happen by itself. You can never do just one thing: the effects of what you do in the world will always spread out like ripples in a pond, and will make faraway and long-delayed changes you have never thought about. Yet you can never do nothing either, for you too are part of the web. Doing just as you have always done is itself doing something, and this too has effects.



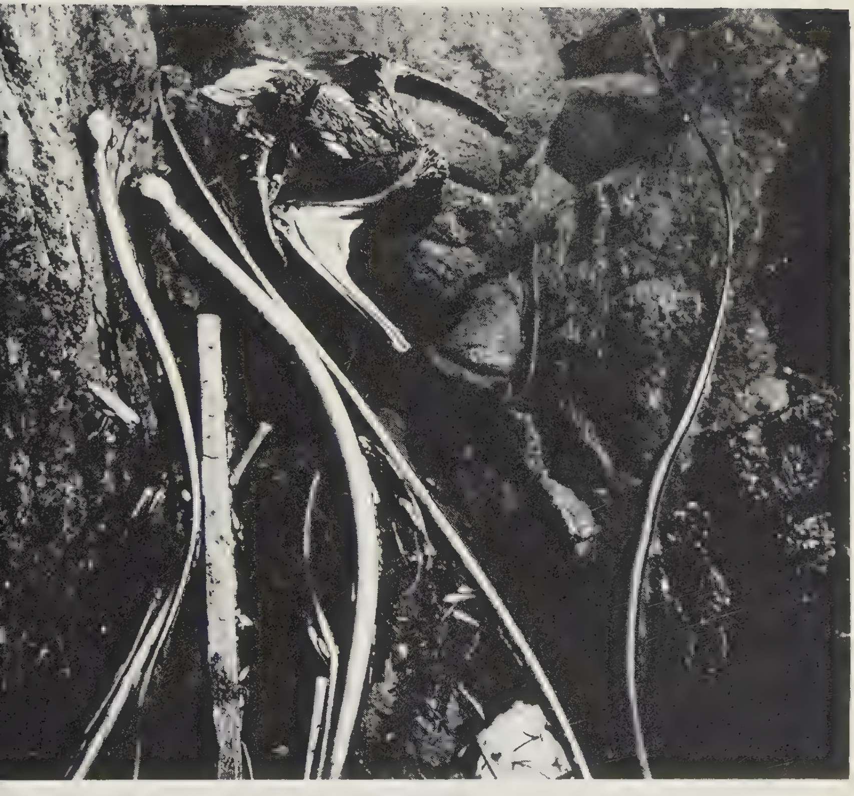
Don Worth : KELP

The earth is round. We have known this for hundreds of years, but few people even today see what it means: that everywhere on earth, linked by cause and effect, is in a sense the same place, and that there is only so much earth and sky and water: so much and no more. We do not have unlimited amounts of anything – of land, of wind, of rain, of food, of sunlight, of away to throw things; for the earth is round, and roundness means limits. Nor do we have immeasurable amounts of anything – for the amounts have been measured and, lately, found wanting. For the first time in his short history, man is now facing the limits of the earth that he likes to call his.

Getting it in proportion

Man does not like to think his history is short, but so it is – so short that it is the merest instant in the earth's history. To see this, to put man's life in context with the earth's, imagine the whole history of the earth compressed into the six-day week of the Biblical Creation – a scale that makes eight thousand years pass in a single second. The first day and a half of this week are too early for life, which does not appear until about Tuesday noon. During the rest of Tuesday, and also Wednesday, Thursday, Friday, and well into Saturday, life expands and transforms the planet: life becomes more diverse, more stable, more beautiful; life makes a home for itself and adapts itself to live there. At four in the afternoon on Saturday, the age of reptiles comes onstage; at nine in the evening it goes offstage, but pelicans and redwoods are already here, lifeforms now threatened by man's wish to have the whole world to himself.

Man does not appear on the earth until three minutes before Saturday midnight. A second before midnight, man the hunter becomes man the farmer, and wandering tribesmen becomes villagers. Two-fifths of a second before midnight, Tutenkhamon rules Egypt. A third of a second before midnight, K'ung fu-tzŭ and Gautama Buddha walk the earth. A fortieth of a second before midnight, the Industrial Revolution begins. It is midnight now, and some people are saying we can go on at the rate that has worked for this fortieth of a second, because we know all the answers. Do we really know that much?



Edward Weston : PELICAN

Man likes to think that he has somehow stopped being a part of nature – that he controls nature and can do what he likes to nature without putting himself in danger. This is not true. Nature laughs last. It is one of nature's rules that those who won't play by the rules won't play at all. Nature has often invoked this rule: every living thing that has ever tried to use more energy or matter than the world can provide is now dead. All that now lives has grown in such a way that it lives on the earth's terms – otherwise it would not be living. Man must do this also, or he will meet the same fate as any other 'mistake' of evolution; for there is no reason why everything should come right in the end. The earth doesn't care. It was here long before we were, and will be here even longer after we leave – and perhaps it will be more comfortable without us. We have forgotten how to be good guests, how to walk lightly on the earth as its other creatures do.

Dieter Blum: FIGHTING ZEBRAS

The only trouble with thinking of it
as a living room
is that in a living room
you move things as you please.

The walls don't breathe
or the glasses you drink from, the floor is flat
and doesn't move

the rug doesn't grow
and the pictures on the wall
don't eat with you
at the table.

You do pretty much as you please
in a living room.

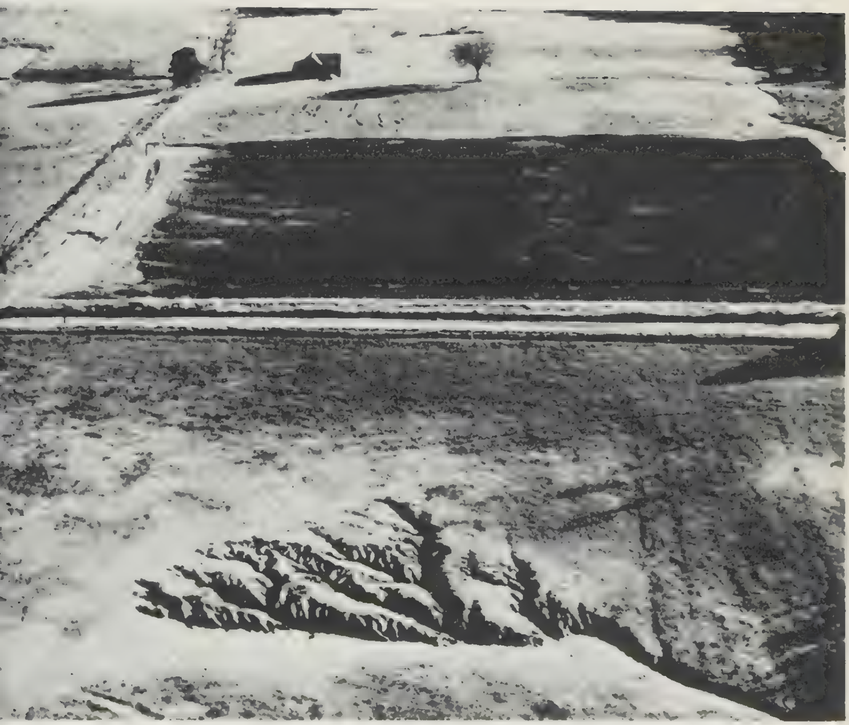
You can't do pretty much as you please
on the earth

not for long, anyway,
not unless you want the bubble to break

and the blackness
come pouring in

like black rain down a cold rainspout.

— Lawrence Collins



Charles Potkin: ERODING FARM, OKLAHOMA (COURTESY STANDARD OIL COMPANY)

Pulsing over the surface of the earth, bathed in the sun's glow, is a shimmering veil of life that on the planet's scale is paper-thin. The air and the seas, which are to us so large, are in a sense tiny and fragile. To see how small they are, imagine that the whole earth has been reduced to the size of a hen's egg. Then, if the seas were gathered together on the same scale, they would be only a single drop of water; all the air, condensed like water, would be a droplet six times smaller; and all the fertile land would be a speck of dust not quite big enough to see. That drop, droplet, and speck are what make this planet unique. In them live all the plants and animals that (for the moment) have passed the test of time – all tied together in a marvel of balance so immensely complex that we have only a very faint idea of how the whole system works.

We know very little, for example, about how life in the world's oceans keeps its balance, how the numbers of the many kinds of plants and animals are kept about the same. But we may soon start to find out how this balance can be made *not* to work, for we are already well on the way to killing all the biggest animals in the sea – the whales. We do not know what this change – rather like killing all the thirty kinds of big grazing animals on the African grasslands, or all the caribou on the tundras – will do to the balance of life in the oceans, but it seems we shall soon be finding out by trying it. If we don't like the result and want to have back again the whales that were sixty million years in the making, it will be too late. We cannot create whales. Did you want this killing to happen? Did you mean to say goodbye?

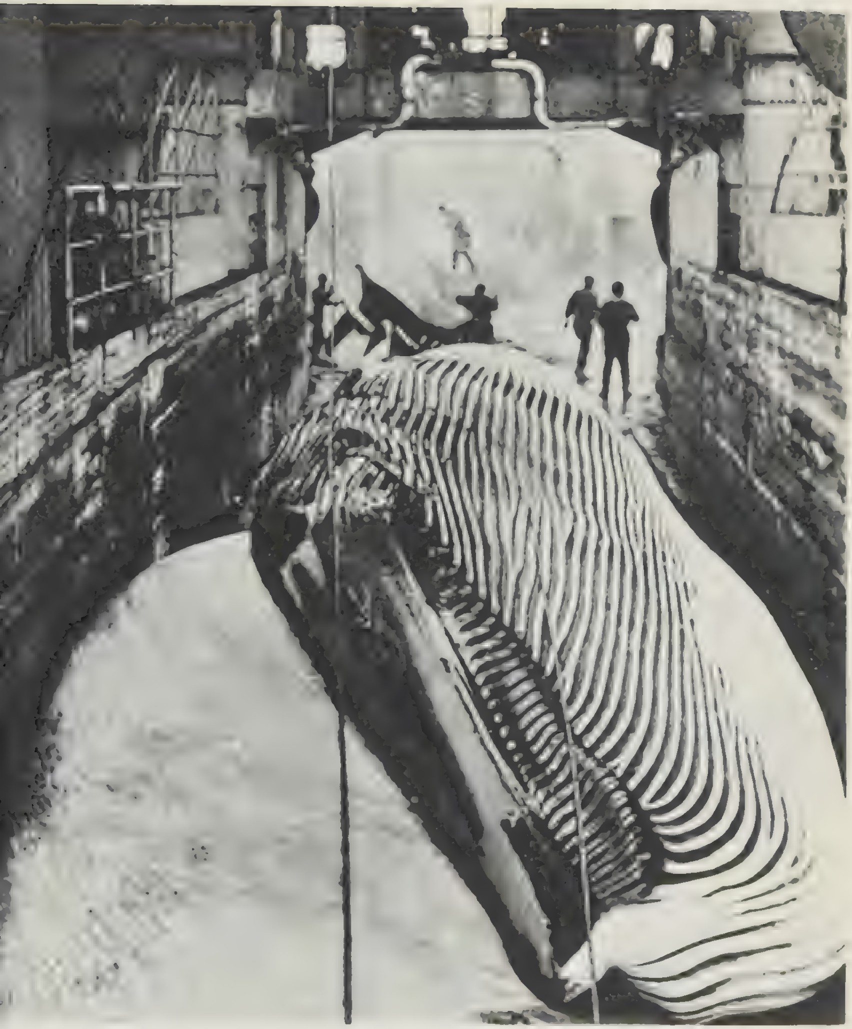
Cedric Wright: PACIFIC, AUTUMN

Killing our fellow-passengers

The story of the killing of the whales will help us to understand many other problems in the world today. For many years, men from various countries, using modern and very deadly machines, have been killing more and more whales. Before 1940, a seventh of a million blue whales swam in Antarctic waters; in 1954, a tenth as many; in 1963, a hundredth as many; today, no more than a few thousandths as many. Yet the whale hunters knew this sort of slaughter must lead to there being no whales at all, for they were killing more whales than were being born. The reason the men wanted to kill the whales is simply profit – profit and ordinary greed. Since World War II, more and more whales have been killed to produce less and less oil (because the bigger kinds of whales have run out); the whaling ships have become bigger and faster but have caught less, for there has been less to catch.

When it became clear to everyone, some years ago, that the great blue whales were almost gone and that many other kinds of whales were also in danger of being wiped out, the whaling countries set up an International Whaling Commission to show how concerned they were. But the killing of whales has gone on anyway, because that is really what some of the countries wanted. As long as someone was going to make money out of the last few thousand whales, a few countries (especially Japan and the USSR) wanted to be sure the money went to them. The scramble for the last few hundred big whales and the last few thousand smaller whales is now starting – and the USSR has just bought three new ships for the purpose. These ships must be paid for, with money made from dead whales. So far, other countries are just standing by and watching; for the whales belong to nobody in particular, and for this reason nobody in particular will defend them.

That is exactly the trouble: whales are a common resource, open to everybody but belonging to nobody. This means that the profit someone can make by killing a whale is bigger than the loss he suffers by there being one less whale in the world, for the whole profit is his alone while the loss is shared by everyone. Thus, from his point of view, it seems best to kill a whale, and another, and another . . . until there are no more.



Finback Whale in factory ship. *Courtesy of Scientific American*

The tragedy of the commons

Here is another example of this problem. Suppose a village has a common pasture where people can graze their sheep – such a shared resource is called a 'commons'. Each extra sheep that a man puts into the pasture makes him one sheep richer, because the grass is free. Of course, the grass that each sheep eats cannot also be eaten by another sheep, so there is less grass to go round, and each sheep on the commons is a little less well-fed than before; but since this loss is shared among all the sheep, each man loses less than he gains by adding another sheep, and another, and another . . . until all the grass is gone. But how can you get each man to forgo his profit by limiting his flock? If he does so because he thinks other people expect him to, he will still be afraid that someone else (who doesn't care what people say) will profit at his expense. If there is no agreement binding everyone, each man will keep adding sheep because he'll think that if he doesn't, someone else will, and the grass might as well profit him rather than the rest.

Remember that the pasture, or the whales, belong to nobody, so nobody has the power to bind everyone to rules for common use. The users themselves must agree on rules for their own common good, for if they are sensible men they will see that if each man does what is best for him alone (rather than best for everyone) they will all starve. In other words, they must give up part of their freedom to use the commons in order to have a commons to use at all. They must agree on a definite social arrangement limiting private greed for the common good, and then they must carry it out. (Note that this is a *social* solution – not a *technical* solution, which this sort of problem does not have.)

Ansel Adams: OVERGRAZING, CALIFORNIA

Yet this making of a social arrangement – like those we have to be sure that people pay their taxes, or hunt and fish within the legal limit, or park their cars only as long as the rules allow – is what countries have not yet done about whales. Most countries have stopped their own people from whaling – they merely let others kill the whales and sell them the products – but two selfish countries have not stopped whaling, and those two are well on the way to denying whales to everyone in the world. The only way to stop the killing of whales is to stop killing them. If there are to be whales in the world, all the countries that have stopped their own whaling must together put such pressure on the rest that they too will stop their whaling at once: that is, all nations must unite to protect their common interest in the good earth that supports them. Trends now run the other way – letting each nation abuse the earth that all nations share – but trend is not destiny, and we can and must do better. First we have to talk to each other, and that is what this book is about.

Two species in trouble

The great whales are in trouble because they are a commons, a resource free to all but owned by none. Another animal, man, is in trouble for the same reason: the earth that supports him is in general used by all but owned by none, and he uses all its resources as a commons – its land, sea, air, and climate – rather as he is using the whales, that is very badly. The oceans, seven-tenths of the planet, form one of the greatest commonses now being most abused by man. The people of many nations could not survive without saltwater fish – sixty million tons of it a year, all free – and the oceans are also the mother of the earth's air and weather. Thus our lives depend on the health of this ocean commons as sheep depend on grass. Yet life within the oceans, as on land, is fragile – it is all based on tiny plants, the phytoplankton that are the grasses and grains of the sea and that live in the sunny waters within about a man's height of the ocean's surface. This thin life-giving layer of water so critical for all life is also the part of the ocean that man damages most.

zilárd Kabáczy: WINTER FISHING

The earth is being washed all the time by rain, and rain goes down to the sea, taking with it whatever it can move or dissolve. It goes out by way of the estuaries and coastal shelves, where most of the sea's living things breed and pass the most delicate parts of their life-spans. The rain also washes the air, and whatever we have added to the air falls with the rain, mostly on the sea. All this takes time: many years may pass before something spread on the land is washed to the sea. This is why only about a quarter of the twenty million tons of DDT already spread on the continents has reached the sea yet. But although only a thousandth of that twenty million tons has so far become part of the sea's living things, that tiny fraction has already damaged them in ways we can measure. The more DDT we use, the more will reach the oceans – after a time-lag of ten or twenty years. Because of this delayed action, if we keep using DDT until something goes even more seriously wrong than it has done already, we shall stop too late.

Poisons are forever

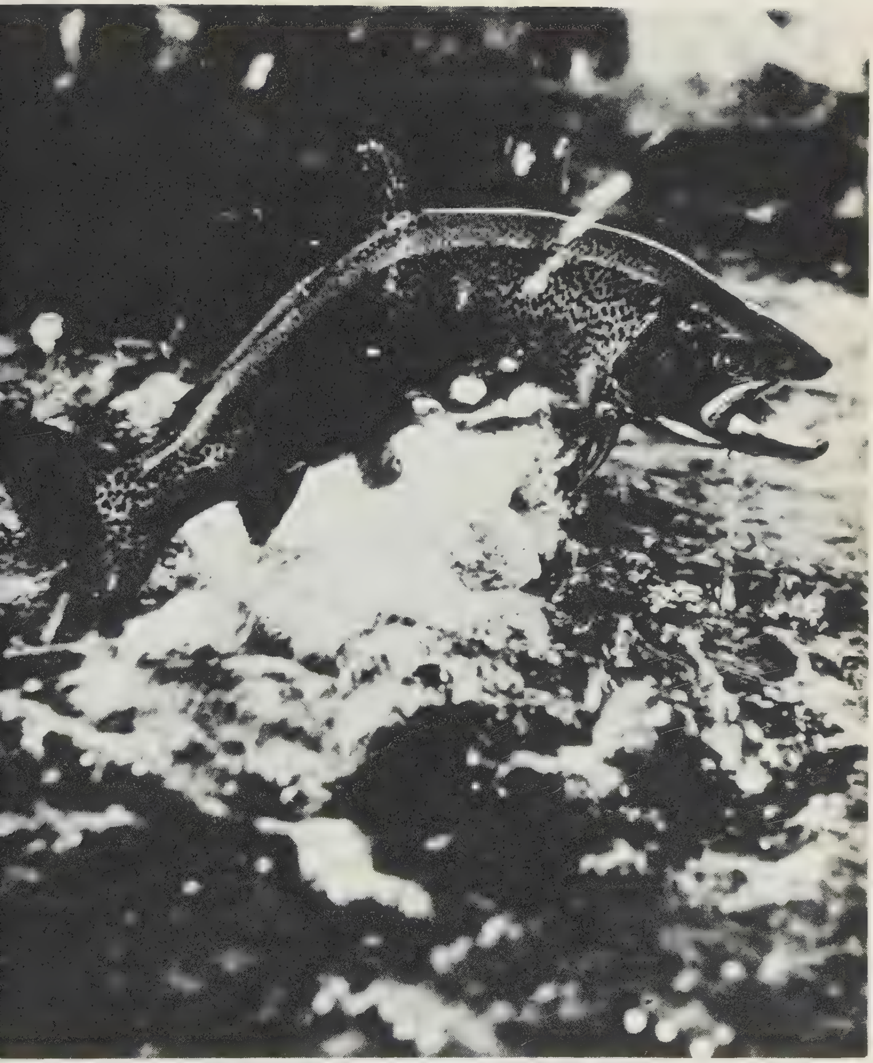
Metals such as mercury, lead, and cadmium (and many more) are slowly washed into the ocean in the usual course of things – rainwater passes through soil and over rock containing these metals. But man is adding these very poisonous metals to the rivers and seas about ten times as fast as nature did before, and as a result, many people have already died or been terribly injured by eating fish or other food from metal-rich coasts. It is likely that the harmful effects of the different kinds of heavy metals and other industrial poisons now being poured into the sea do not merely add to each other, but multiply; that is, these materials are more dangerous mixed together than on their own.

Dave Bohn: BALD EAGLE . 1965

The normal life of waters is upset, too, by nitrogen and phosphorus added by man, mainly in the form of fertilizers, detergents, and sewage. In ten years these nutrients can change a lake or estuary that has been clean and pure for thousands of years into a stinking swamp. This is already a problem in almost every country. We do not know what it may do to the oceans. It is a measure of how far we are out of balance with nature that we use our sewage to foul the water rather than to enrich the soil that desperately needs it. This problem is even worse because the rich countries now tend to feed their farm animals in huge factory 'feedlots' that make at least as much sewage as cities do.

We all know about oil spills from tankers, and these spills do a lot of damage because they happen near the shore. But the oil spilled in shipping accidents is only a tenth of all the oil – two million tons a year – dumped into the sea from all sources, and that in turn is only about a fifth of all the oil and oil products that the sea receives – the rest falls out of the air. Most of this total load of oil stays on the surface of the ocean, where the basic life processes go on, and we do not know what it may do – but it may well increase the damage that DDT and other pesticides do to ocean life.

In the height of stupidity, many nations have also been dumping into the oceans casks of seething wastes from nuclear reactors, a new kind of garbage that will remain deadly for as long as a thousand years (longer than the casks will last – many of them are broken already). Some of these wastes consist of atoms chemically like those found in living things, and these atoms can build up in living things. For example, algae may come to contain hundreds of thousands of times as much of certain kinds of dangerous atoms as the water around the algae contains. If several such concentrations multiply – if, say, atoms are concentrated a hundred thousand times by a plant, ten thousand times by an insect that eats the plant, and another ten thousand times by a fish that eats the insect – then the total concentration, ten trillion times, defeats even the 'drop in the ocean' approach. Such building up of poisons can happen, but we do not yet know how widely it is happening. If it is, we cannot now stop it. Worse still, nuclear waste products can damage not only things now alive but also the unborn, by damaging the genes (the chemical code that controls inheritance) in ways that are passed on to other generations.

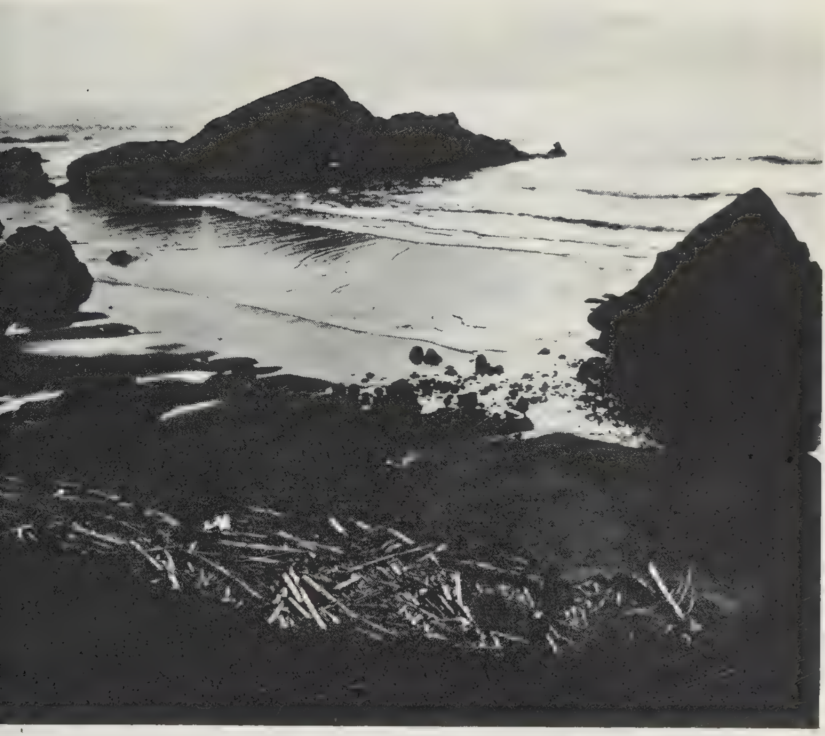


Sláva Stochl: LEAPING TROUT

Nations that purposely dump these and other kinds of poisons into the sea know (or ought to know) what harm they are doing, but people who dump wastes on land often do not – they think that whatever they throw away somehow stops existing. This is not so. Nothing ever just goes away; it always turns up somewhere else. If you think the fertilizer you spread on your land stays there, think again: it is probably in the water you haul from the well. If you think you can pour waste oil down a drain and thus make it disappear, go into the middle of the ocean and you will find it bobbing there inside a lump of tar. If you don't know where the rubber of your new car-tyre disappears to as the tread wears down, look inside your lungs and find out. Every year we burn hundreds of thousands of tons of plastics that contain the deadly gas chlorine. Where does it go? We don't know yet, but you can be sure it doesn't just disappear. We shall be hearing a great deal more about it. Everything must go somewhere.

Throwaway boomerang

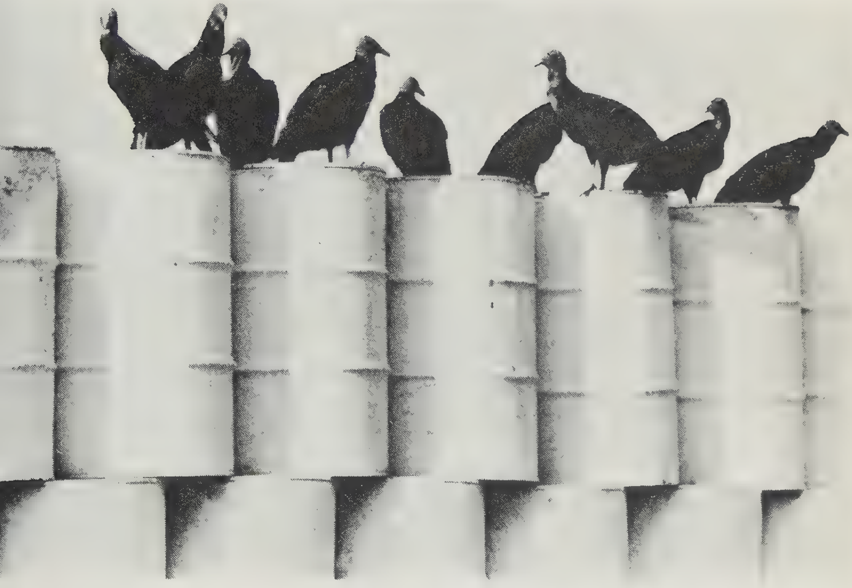
The things man throws away are very different from the 'wastes' of other living things, for in nature there is no waste – everything is re-used. This is so because for every substance found in nature, there is also a substance that can break it down. But many of man's wastes cannot readily be broken down in nature. They therefore build up. They do not fit in, and they clog the works. Every bit of manmade fibre (such as nylon) either is burned, making dirty air, or gathers as litter. Also, many manmade wastes, once thrown away, react with each other to make new chemicals. Man is already adding to the world about a million kinds of chemicals that were not there before and that nature may not have any way to break down. Where these chemicals go, what they do, and what new compounds they form after they are thrown away are hardly known, but we are slowly finding out. The main lesson of what we have learned so far is that we don't know any of the really important answers yet, nor even the questions to ask: we are conducting a huge experiment, with all living things as the subjects, and without even knowing what materials we are



dward Weston: ROCKS, BEACH AND DRIFTWOOD adding. It seems very likely that the worst pollutants are the ones we haven't discovered yet. As matters stand, we know so little about what we are doing that almost the only way for us to discover a pollution danger is for something to go so seriously wrong that we notice – and by then it is too late for us to get the dangerous material back again. We are far, far more able to disrupt nature than to know what we are doing, and we can disrupt far faster than we can react to the results. We have no idea of the limits of the earth's ability to absorb any one pollutant without going wrong, let alone a million pollutants at once, some of them spread round by the millions of tons.

What will you do for an encore?

On the round earth nothing ever disappears, but that is only one side of the resources/pollution coin. The other side is that on the round earth nothing ever appears either – there is only so much of anything and no more. What we do to resources is to move them round, to change the pattern in which they occur: in general we take concentrated resources, such as rich metal ores, and change them into mixed and dispersed resources, such as metals swirling in the sea or scattered on piles of rusting junk. The laws of physics tell us that going in the other direction – starting with diffuse resources and sorting them out into concentrated chunks – takes a very large amount of energy (as you will know if you try to sort out, say, fifty different kinds of tiny seeds all mixed together in a pile). Some people have such faith in future technical progress that they think there are no laws of physics any more. They are wrong. In practice, once we scatter our resources we cannot gather them together again. That is one reason why we are foolish to sprinkle them over the earth as pollutants. Nature never wastes, and therefore never wants; man is just the opposite.



Harold Null: SCAVENGER BIRDS AT REFUSE TIPS OUTSIDE CARACAS
FAO Photo

The kinds of pollution that most people notice – dirty air, putrid rivers, derelict land, noise, ugliness – are serious problems that harm the health and happiness of everyone. But most of these problems are not the most basic problems man faces today: they are more the symptoms of the disease than the disease itself. If all these forms of pollution got much worse, a great many people would die, but if the world's climate were not changed and if the life in the oceans were not killed, then it is quite possible that man as a species would survive. If, for example, severe pollution reduced the average life-span in a rich country from seventy years to thirty, that would still leave plenty of time for breeding; and perhaps some people would be willing to give up that much of their lifetimes in order to help polluting industries continue to grow. But what *can* make the whole system collapse most quickly and man die out completely is not pollution in the usual sense (except for kinds that might harm, for example, the oceans or climate) – not what happens to resources after we use them – but not having resources to use at all. Most countries' governments have just started to admit, if pushed, that pollution is a problem; and since it is one that people can see, smell, taste, and hear right now, it is easier to believe in than symbols or words about the future, and easy to attack as if it were the whole problem. What no government in the world seems to have realized yet – though, as usual, many people are ahead of their governments – is that though many forms of pollution can be cured (at a cost), the basic causes of pollution and of running out of resources cannot be covered up in that way – only prevented in advance by making major changes in what societies are trying to do. The number of people on earth and the resources used by each of them cannot, on a round earth, keep growing as now, for there is simply not that much to go round.

Sándor Tamásy: SANDSTORM

Replenish the earth

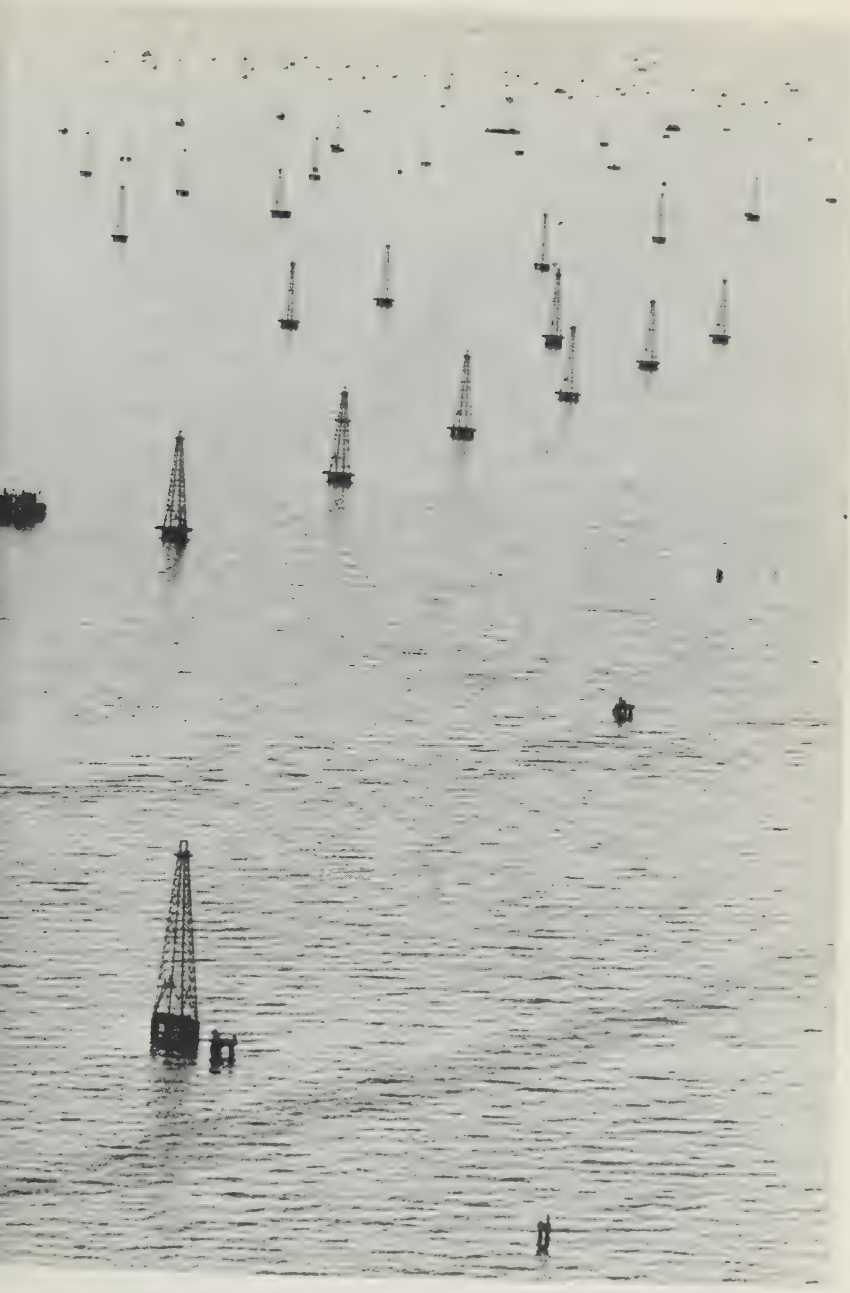
When a man rents a farm, he often has to promise to care for the land so that it will be as fruitful at the end of his term as it was at the start. This is the root of all husbandry: to sustain and replenish the land. The farmer would not be allowed to grow so much that the soil became depleted and infertile, nor to dig up the humus and carry it away, nor to overgraze his pastures so the grass was killed and the soil eroded. We have inherited a fertile planet of fixed size from our parents, to pass on in turn to our children, but instead of looking after it we are destroying it: we are not farming but mining, not harvesting a renewable crop year after year but rushing to get all the possible yield for ourselves as quickly as possible, and as for our children, let them inherit a desert. Instead of living on our interest, and leaving our children free to choose the sort of lives they will want to lead, we are spending our and their capital; and by refusing to ask what it costs the earth, we are spending it very quickly indeed.

Margaret Bourke-White: CONTOUR PLOWING

To see how fast we are throwing away the earth, consider oil – the lifeblood of industry, the source of half the world's energy and (if we trace them back) of most of the world's plastics, drugs, and other manmade chemicals. Oil was as much as hundreds of millions of years in the making, but we are using it all up in a hundred years, and doubling every ten years the amount that we use. This is a fantastic rate of increase: it means that each year we are adding to what we are already using the production nearly of a new Kuwait, plus 25 refineries. To keep up with this sort of demand ten years from now we shall need every year, just to cover the *increase* for that year, a new oilfield producing more than Saudi Arabia produces now. Twenty years from now we shall have to discover a huge oilfield the size of the North Slope of Alaska – every *few months*! And many people in industry and government, having predicted this sort of rising demand, are working hard to make it come true. Clearly this is crazy. As the great chemist Mendeleev said a century ago, oil is so precious as a basic raw material that we should not be burning it as a fuel at all. 'When we burn oil,' he said, 'we burn money.' Oil has many uses – we can even make food out of it, and it is so useful for making objects that ten years from now we may be using more plastic (made of oil) than steel. Since oil is the chemical basis of pesticides and of some other chemicals used in farming, and the main source of energy for making the rest, it is even fair to say that much of the food now eaten in the rich countries is made not of soil but of oil.

Double, double, toil and trouble

The doubling of world demand for oil every ten years means that if an incredible new discovery *doubles* the total amount of oil that we have, we shall have put off by only *ten years* the time when we shall run out – now scheduled for about 1992 if we find the new reserves we are looking for, otherwise sooner. And as oil reserves drop, the countries that have the oil will want more money for it (as they have already started to do), but the countries that want the oil will not want to pay. It seems likely that, as in most things, the lions will try to take the lions' share, and there will be growling. Wars have already been fought over resources, for example in the Congo, and many poor countries are tiring of sending their minerals abroad to help raise someone else's standard of living.



Harold Null: A FEW OF THE 4500 OIL RIGS IN LAKE MARACAIBO, VENEZUELA

FAO Photo

Copper is another good example of our throwaway-planet approach. We are scraping the bottom of the barrel already. We started long ago with solid lumps of copper metal, and then mined the rich ores. Now we are reduced to mining ores so poor that for each ton of copper we must process and discard two or three hundred tons of waste (and use about eleven million watt-hours of energy). Much of the copper we get in this way is used once and thrown away. If we use up the known world reserves of copper at the present rate of use, we shall reach rock-bottom in thirty-six years; if this rate of use continues to climb as it has done lately, we shall run out in only twenty-one years – and the rate of use is in fact climbing faster and faster. If we find new copper reserves four times as big as all the reserves that we now know about, we shall run out in about forty-eight years. If we find new ore *and* re-use copper *and* substitute, we may get along for sixty years. Without copper, industrial society cannot work. Without copper we cannot make any efficient wires or electrical machines – unless we use the even rarer and more costly metal silver, which we shall run out of in about twenty years (after which there will be no photography). (Copper forms less than a ten-thousandth of the earth's crust; silver, a ten-millionth.) Of course, we can make wires out of aluminium instead of copper – they are not nearly as good, but we shall have no choice. The trouble with the substitution is that aluminium, which is already being used to replace steel (because we are running out of good iron ore), will probably last only thirty to fifty years. We have enough aluminium to last about one hundred years if we use as much of it each year as we do now, but in fact our use of it has been doubling every nine years for some time, and even the largest reserves cannot last long at that rate. This example shows how hard it is to substitute one resource for another when you are running out of all of them.

Indeed, for some important jobs there is no substitute at all for certain resources – platinum to make some kinds of chemical reactions happen in factories, metals like tungsten and molybdenum and nickel and manganese to make special kinds of steels, tin and zinc for universally used alloys, and mercury in certain basic industrial uses and in devices for controlling temperature or pressure. Of these metals, only mercury is being used up at a roughly constant rate – there is enough (in Spain, Italy, and Yugoslavia) for about thirteen more years – and mercury is a major danger to the world's rivers, lakes, and oceans because, instead of saving it, we are dumping about half of it away after using it just once, and it is very poisonous.

artmut Sch

Postponements and cancellations

To make it even clearer how fast we are running out of resources, think what this means: if the pattern in which we use the sixteen most important metals is what the US Bureau of Mines predicts, the known world reserves will last less than thirty years for eight of them, less than fifty years for twelve, and less than a hundred for all. (A new discovery doubling reserves will extend these lifetimes by an average of under thirty years.) After that, if we want any we must go digging in our own junk-piles, using huge amounts of energy (more than we'll have) to sort out our junk and reclaim the metals we recently threw away. In some cases the junk-pile is the whole world – the lead that comes out of our car exhausts is so scattered we can never get it back.

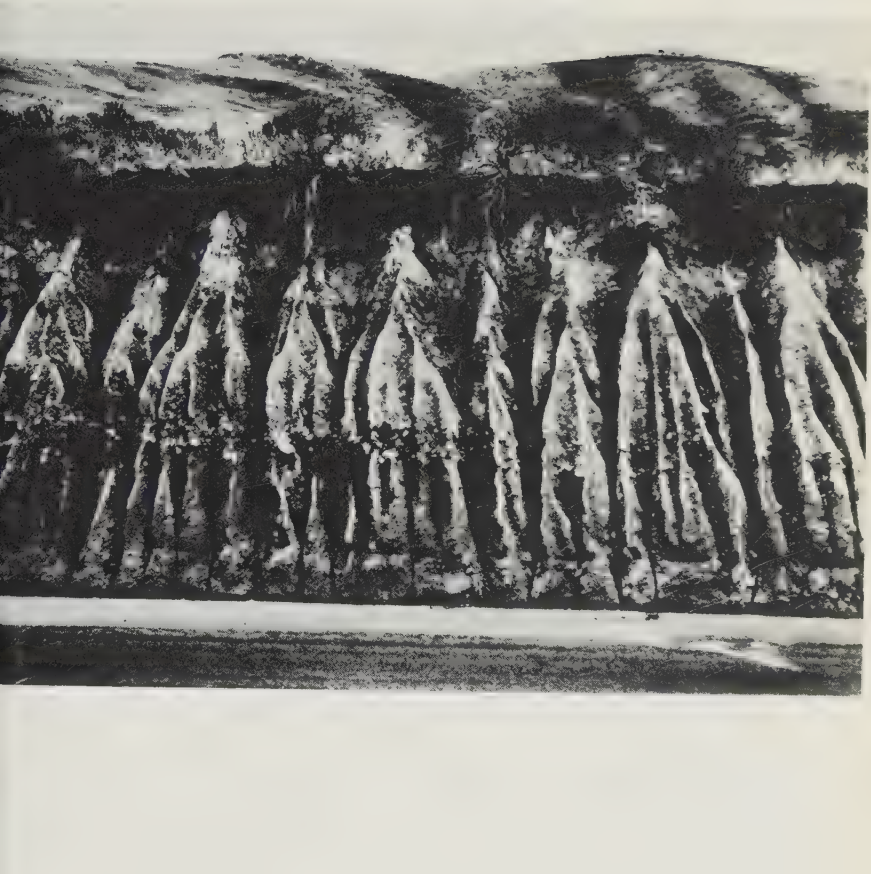
We can put off the time when we run out of these metals by recycling our wastes – by sorting out and reclaiming the metals as we are throwing them away, not afterwards when they are all mixed together. But in recycling we are bound to lose a little metal each time. Even if we could prevent that, we would still – if we behaved as now – run out only a few decades later than we would without recycling! This time may be vital for us, and we should not scorn it, but it is not for ever. The reason for this is that recycling only keeps us from losing what resources we have; it does not make new reserves. So if each year we use more than we did last year, there will come a year when we want to use more than there is in all the world. That year will come soon: for the sixteen basic metals, the average time it now takes to double our rate of use is just sixteen years – half what it takes to double our own numbers – so our children, if they live as we do, will use up these metals more than twice as fast as we do, and their children more than twice as fast as they do . . . until there is no more. Indeed, even in our grandchildren's time this whole process will have ground to a halt. Careful study shows that unless we change our ways, nearly all of our basic raw materials will be too costly for practically any use – less than a century from now. When growth fights the limits of the round earth, the limits will always win. And mining the bottom of the sea cannot help much; even if we can afford it, and even if the sea floor is as rich in minerals as the land – both of which are unlikely – we shall have put the sea's life in great danger in order to gain ourselves only about fifty years.

Dave Bohn: GRANITE, JOHN HOPKINS INLET. 1966

Mines grow no second crop

To make matters worse, many of the special materials we shall need to fight pollution – such as platinum for fuel cells and for cleaner factory chimneys and lead for electric batteries – are among those vanishing fastest. And we may be caught by running out of resources that we do not now think matter – such as the rare gas helium, which forms a fiftieth of the natural gas in certain wells. Helium is usually allowed to escape when the gas is burned because nobody can be bothered to save helium. But there is no other place to get it except from the air (in which it is four thousand times rarer and costs fifty times as much to separate). Without helium we cannot ever develop nuclear fusion power (the best long-range hope for supplying large amounts of energy), nor cables for sending electricity over long distances without wasting it, nor many other things we may later want to make. What other riches are we throwing away without knowing their use?

The way in which mineral reserves in the ground are gobbled up by rapid growth in demand is exactly like the way in which food reserves, land, and everything else that man uses above ground are gobbled up by growth in human population – by putting more and more people on the earth, like sheep onto a common pasture. Of course, some of the growth in demand for minerals comes from having more people using them, but much more of the growth in demand comes from having more world industry for each person. With growth in resource-use, as with growth in the number of people, the limits of the round earth are by now so clearly in sight that there can be no doubt what we must do: we must have no more growth. No more means no more. Slower growth is good but not good enough – we need zero growth both in the number of people and in the demand by each person. Once we have achieved this, we can try to reduce our numbers and our demands to a smaller level, one that the earth will be able to support for a long time. Then we shall be raising on the farm only what it can keep yielding for ever, rather than pushing it too hard and mining its soil.



Wynn Bullock : EROSION

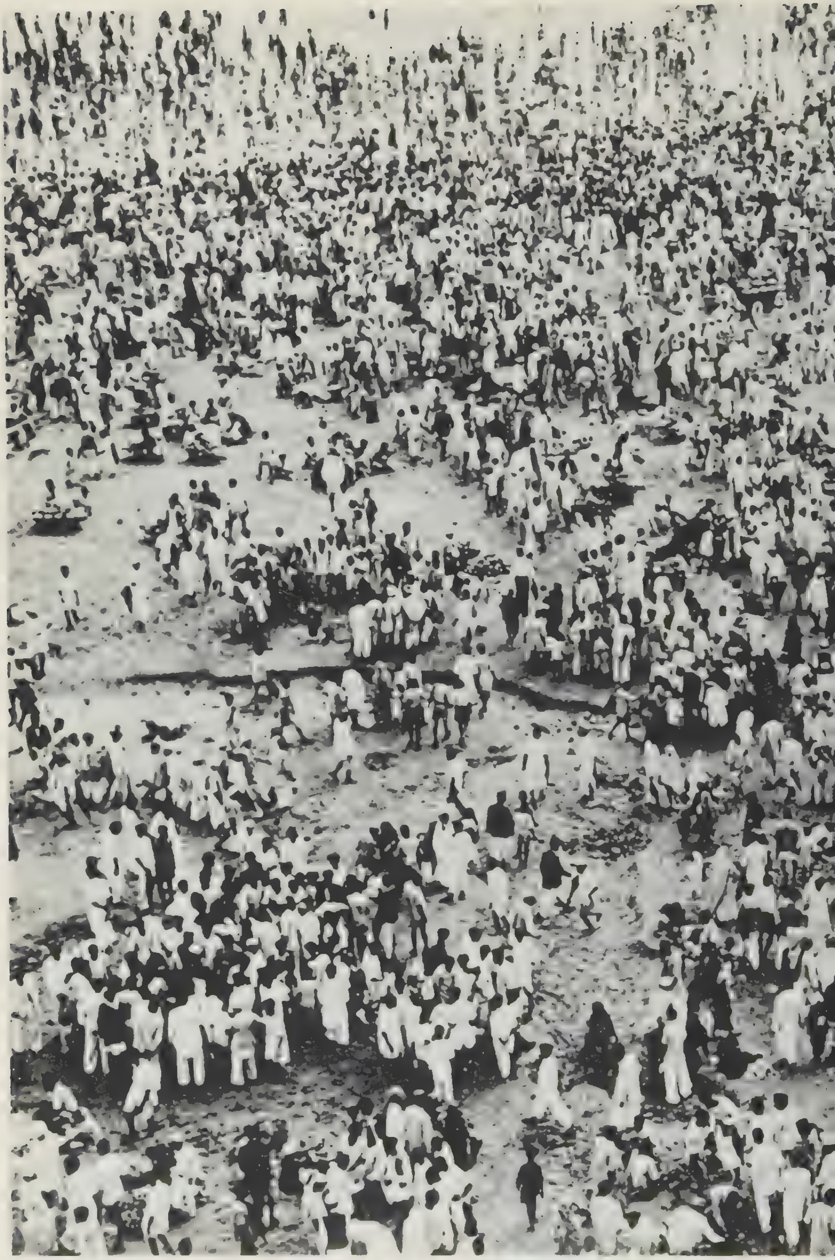
Too many

But in these days it is not thought nice to say that there are too many people. Rich countries say they have just the right number of people – or too few – and if only the people in the poor countries would stop having so many children, everything would be lovely. Poor countries say in return that it is the rich countries that are using up all the earth's resources and leaving none for those later in the queue; most poor countries think population control is a plot by the rich to keep them down; and many poor countries say too that unless they become industrialized like the rich countries, they will never be able even to feed their people, let alone to give them the greater wealth that people in rich countries already enjoy. Rich countries then agree that nobody can become richer unless everyone does. (They like this idea because it makes the gap between rich and poor even wider.) And while countries argue, each saying the problem is somewhere else and will go away if ignored long enough, the basic problem gets worse: the number of people on earth grows by more than two each second, and the demands made on the earth by each person grow even faster.

Eight thousand years ago there were perhaps five million people in the whole world – about as many as there are now in Djakarta or Cairo. It took almost eight thousand years, doubling roughly once every thousand years, to reach five hundred million, or nearly the population of India. This happened in about 1650, when the average man lived to be only about thirty years old – that is, when many babies died. The next doubling, to one billion people, took about one hundred eighty years, to 1830. The next doubling, to two billion, took about one hundred years, to 1930. The next doubling, to four billion, will be finished in about 1975 – we have nearly 3·7 billion now, when the average man lives about fifty-three years. The next doubling after that, to eight billion, will be finished ust after the year 2000. What is wrong with this process? Simply that there is no end to it. But we know the earth is round and cannot support continued doublings of anything. If we do not purposely stop our Breed Now, Pay Later practices, then famine, plague, or war will stop them for us, and many more people will suffer. Later on in this book we shall consider whether we shall be able to feed, thirty years from now, three and a half billion more people than we cannot feed now.

A plague of people

The dramatic increase in man's rate of increase – doubling in a thousand years, then 180, then 100, then 55, now about 32 – has led us to what is called a 'swarming stage' by scientists who can study it in other animals. It s caused by the removal of controls that were limiting population growth. If lynx are limiting the number of rabbits and you kill all the lynx, the rabbit population will zoom up in an outbreak (just like ours) until there is no more food or space; then all, or nearly all, of the rabbits will quickly die of hunger and disease in a population 'crash'. Our sudden spurt in numbers during the past few decades has the same cause. Modern medicine has mostly removed man's ancient hunters – the microbes of malaria, yellow fever, smallpox, and cholera – but people have kept having about as many children as before. Many diseases once fatal to children are now controlled too. Without any other controls to take the place of diseases, t is natural that our population should soar. The same would happen with rabbits, or bacteria, or locusts. What is new about our growth is that this s the first time that any species has reached a swarming stage over the whole earth at once – this is a unique problem that we don't like to admit we have caused. If a chart showing human population growth were shown to an agricultural scientist, and if he were told that it showed the population of a worldwide pest with a huge appetite, he would certainly suggest that measures be taken to control it at once!



Ferenc Berko: BATHERS ON THE GANGES

The gluttonous species

Even as animals – leaving aside the effects of industry – our impact on the earth is enormous, for we are by far either the biggest numerous animal or the most numerous big animal on earth. Already the people of the earth eat so much that if they all ate plants – the lowest and most plentiful level of food that the earth offers – they would use about four thousandths of the world's *total* crop of plants, both land and sea. This may not sound like much until you recall that we are supposed to be sharing this crop with nearly a million kinds of insects, eight thousand five hundred kinds of birds, and four thousand two hundred kinds of mammals (to mention just a few kinds of animals) – but we are hogging all this for just one species! We are trying to get round this problem by calling all the other animals 'pests' and then wiping them out; we have declared war on everything that wants to share our table. The food conflict is even worse than we have said, because people eat not just plants but also animals further up the food chain – grazing animals, or shrimp that eat the tiny plants of the sea, or fish. If we all ate animals that ate plants, we would be using more like four-hundredths of all the world's food; if we went one level higher still, eating animals that eat animals, we would be using more like four-tenths of all the world's food.

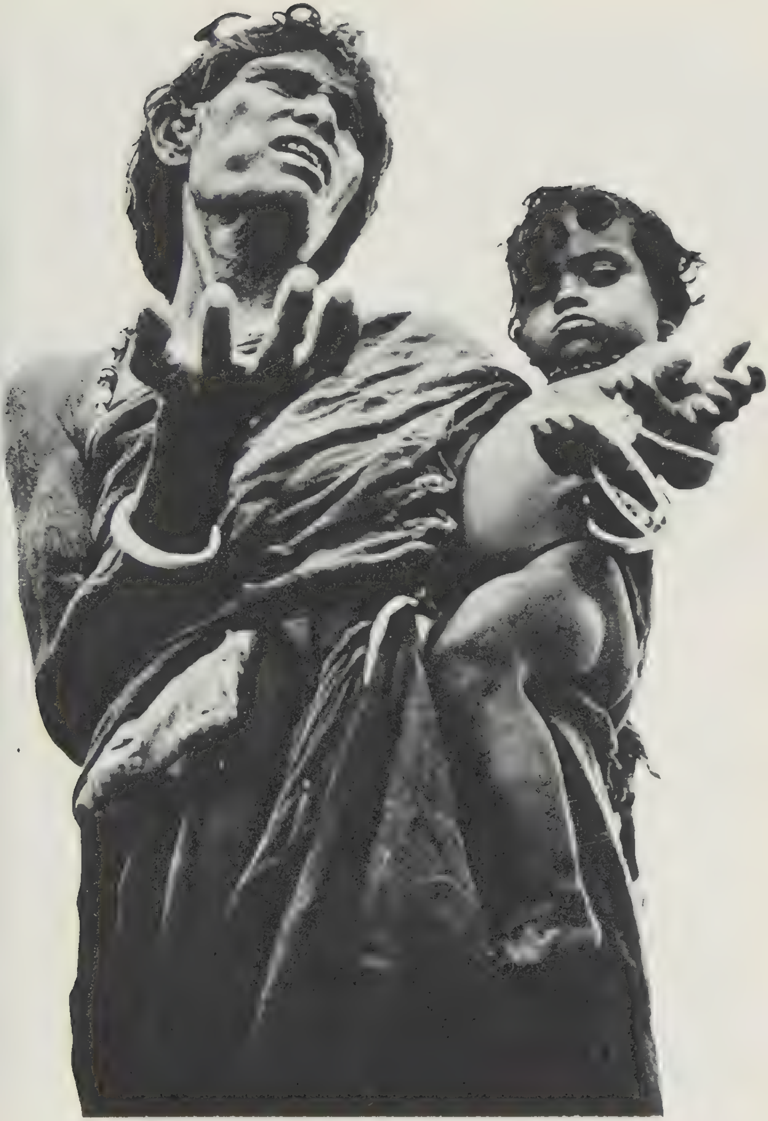
If you think we can greatly increase the amount of basic food in the world through better farming, think again. Life is always trying to become stronger and more efficient – and life has been doing this for three billion years. We probably cannot do any better in thirty. If there were a better way to do things, that way would already be here. It is not here because this is the way the world works. To put it another way, the system of plants and animals that grows up in a given place if you leave it alone for a few centuries is the most productive system that could possibly live there, given the state to which nature has so far evolved, and nothing we put there instead can possibly use the sun's energy any better. It simply cannot be done, for if it could, nature would have done it long ago. She has been playing this game for much longer than we have.

Sándor Bojár : AFTER PHEASANT HUNTING

Stopping the juggernaut

There is one more lesson about the way our population is growing: as with resource-use, the time has already come when things start to happen with dizzying speed. In 1900, within the memories of people now living, the doubling time of world population was one hundred fifteen years; now it is about thirty-two; when a child born today reaches the age of sixty, there may be four people in the world for every one living today. It is as though the earth were spinning faster and faster. With resources, too, you can seem to have plenty only a few years before you run out – and unless you see this coming, you have no time to adapt or forestall. We have very little time now. We are already so far into this pattern of growth that it has a life of its own and cannot be stopped right away. If, by some miracle (which nobody studying population thinks will happen), population growth in the poor seven-tenths of the world dropped to zero by the year 2000, population would still not stop growing there until about 2050 – and would then stop at two and a half times what it is now. (This is because of changes in the age structure – in the relative numbers of young and old people. Such changes take a long time to drift back to a stable state.) Besides, about two-fifths of the people in the poor countries are under fifteen years old, and they will soon start having children. If, by an even greater miracle, every couple had only two children, starting today, world population would become stable in about 2020 – at over six billion. So even if we start to act now, things will still get worse at first. The later we start, the less likely things are to get better later.

You may be thinking that we cannot go on this way, and that is quite right. But if we do not stop by ourselves, we shall be stopped in a very effective and cruel way, just as would happen to rabbits or lemmings or locusts. In other words, population will not stop growing by itself; nor is there any reason to think it will slow down by itself (except in a very few countries that don't much matter because they are neither very rich nor very populous). If we don't want to risk nature's solution to overpopulation, we need a solution of our own.



erner Bischoff: FAMINE, INDIA

Some say that people will have fewer children if they are just asked to. This is not a good enough answer, for two reasons. First, we are up against the problem of the commons again. Many people *want* to have lots of children, and the gain from having each child – to work in the fields, to support you in your old age, and so on – is all yours, while the loss – each child means there is a little less of everything all round – is shared by all. Thus it seems best to have another child, and another, and another . . . until we are in the mess we are in now. As in any other sort of commons, poeple will not want to restrain themselves because they will be afraid of being outdone – outbred – by everyone else; so nobody can be expected to limit his family unless everyone has to. The other reason you cannot limit population by asking for it is that some people will always respond more than others to such a request, and those who ignore you will soon outnumber those who heed you. (This sort of force has been working for a long time now – we are descended from the people who outbred the rest.) Hence you cannot limit population by request; instead, you need the 'definite social arrangements' we talked about earlier. (Later on we'll return to the hard question of what kinds of arrangements might work.) But first people must agree that there is a problem and that they must work together to solve it. Most countries do not now admit this, and some even want more growth.

Yet it should be obvious to all that there are too many people. Countries like Costa Rica and the Philippines, where population doubles every twenty years, must in that time double every road, school, power plant, doctor, farm, and so on in order to stay in the same place. This would be hard for a wealthy country with strong industries, rich resources, and fertile farms; it is impossible for a country with none of these. And though the rich countries (like the USSR, Japan, and the USA) double much more slowly (every sixty-three years for those three), growth is almost a bigger problem for them, since each person consumes as much of the earth's resources as dozens of Indians do. The only way most rich countries stay alive is by living off of other countries as well, for they are seldom self-sufficient in minerals, and some cannot even feed their own people. Population growth even at its slowest is a great drain – in Britain, for example, where population doubles in about one hundred forty years, the daily increase requires a new school each day just to keep up.

B. Pokrovszky: TAIGA

The results of having too many people are easiest to see in cities, and cities all over the world are full of the same problems – no food, no space, no jobs, no money, no health, no peace, no hope. Everywhere, and most of all in the poor nations, people are moving faster and faster from the countryside into the cities, bringing the cities closer to collapse. We shall have more to say later about this problem too.

Can we feed all these people we are going to have – at least six and a half billion in the year 2000? Maybe not; after all, ten or twenty million people are *now* dying each year from too little food, so we have a long way to go. If we want more food, there are only a few methods we can try, and it is worth looking at each one.

Multiplying bread

First, we can use better the food we have. Few governments are trying this, but it is the easiest and best method there is. It means storing food more carefully so that less of it spoils – India probably loses at least a quarter of its food crops for lack of good warehouses, and warehouses are cheap.

Even more important, we can use food from lower down the food chain – closer to the basic production of plants. This lets us feed more people just as well by making better use of the plants we have. If you trace it back, all flesh is grass – a lot of grass. For example, only a tenth to a fifth of the grain that a cow eats becomes meat – the rest just keeps the cow alive. So the land it takes to grow the grain to feed the cow to feed people will feed five to ten times as many people if they eat grain instead. As food becomes scarcer in the rich countries, more and more people will have to give up eating meat and go back to the basic plants. Likewise, hogs and chickens in rich countries are often fed on fish-meal (which people can eat, though it is not as tasty); in this way a lot of cheap protein is made into a little expensive protein, but the cheap protein is just as nourishing. Thus Peru, which catches a sixth of the world's total haul of fish, sends more protein (as fish-meal) to rich countries than it gets back in other ways. This is a common pattern – a poor country going without food to feed a rich country. Of course the rich countries pay the Peruvians for their fish-meal, but the Peruvians cannot eat money, and the

László Kovács: SQUARE FISHING-NET

fish-meal eaten by chickens in Europe cannot also be eaten by Peruvians; so the Peruvians stay short of the protein they need. Here is yet another example: Denmark boasts of having so much food that it exports protein (as hams, bacon, etc.). But Denmark is probably the world's greatest net importer of protein per person, for the hogs and chickens are fed on cheap protein from poorer countries – on fish-meal, soy-cake, and so on – and the animals keep as flesh only a small part of the protein they eat. In a world that does not have enough protein to go round (and the food shortage is more of protein than of food generally), it would make more sense to eat the cheap protein instead.

Besides using better the food that we have, we can grow more food, either by using new areas to grow it in or by growing more in the same places. The first of these two methods will not work very well, mainly because those parts of the world that are not now farmed are not farmed for excellent reasons – drought, poor soil, bad climate. A good example is Indonesia, in which it was pointed out nearly thirty years ago that Java supported about sixty million people on thirty million acres, while Borneo, with four times as much land, supported only about a twentieth as many people. The difference is in the quality of the soil. In a few places – mainly in Africa south of the Sahara and in Latin America – it may be possible, at very great cost, to bring new land under cultivation, but in most places this would be a waste of money because the soils are too poor, and indeed some land now farmed marginally may have to be given up. Many bare plains are unsuited for farming (as the USSR found out in Kazakhstan), and most tropical soils are even worse. Many tropical soils not only are very poor but also turn to a bricklike substance called laterite if you clear the jungle off them. Once a soil has laterized it stays that way. In Brazil, some years ago, an area of forest at Iata in the Amazon Basin was cleared for farming. Within five years, the soil was like a paved road. The Khmer civilization in Cambodia, about eight centuries ago, cleared the jungle too; the laterite they were left with was fine for building temples like Angkor Wat, but useless for farming, and the Khmers died. In a similar way, the Classic Mayan culture, which used slash-and-burn farming, got too big for the land to support; famine, along with social turmoil and perhaps war, soon wiped out what had seemed an active and advanced civilization. These lessons of history, and the many others hidden in the world's manmade deserts, are important for us today.

Harold Null: EROSION AT SOLO, JAVA. FAO Photo

The "inexhaustible" riches of the sea

If we cannot do more farming on land, people say, perhaps we can get more food from the sea. Can we? Only within strict limits. If we were to put a lot of money – three times as much as now – into new fishing fleets, if we were willing to eat many kinds of fish that nobody now likes, if all nations now stopped polluting the sea, and if we had perfect management to prevent overfishing all over the world, we might in thirty years' time be able to catch, and keep catching, up to twice as much fish as now. (This would be less than a third of the protein we shall need then to keep everyone just on the living side of starvation.) But we seem more likely to do just the opposite – to repeat the story of the whales. Already, large modern fleets with the latest electronic fish-finding machines are starting the first stages of the scramble for the last fish; although the fleets are working harder each year, the catch is going down. Some of the most important fish – Atlantic cod, menhaden, Scandinavian herring – are becoming scarcer already. And these scarcities hit hardest the poor countries that cannot afford modern fishing gear.

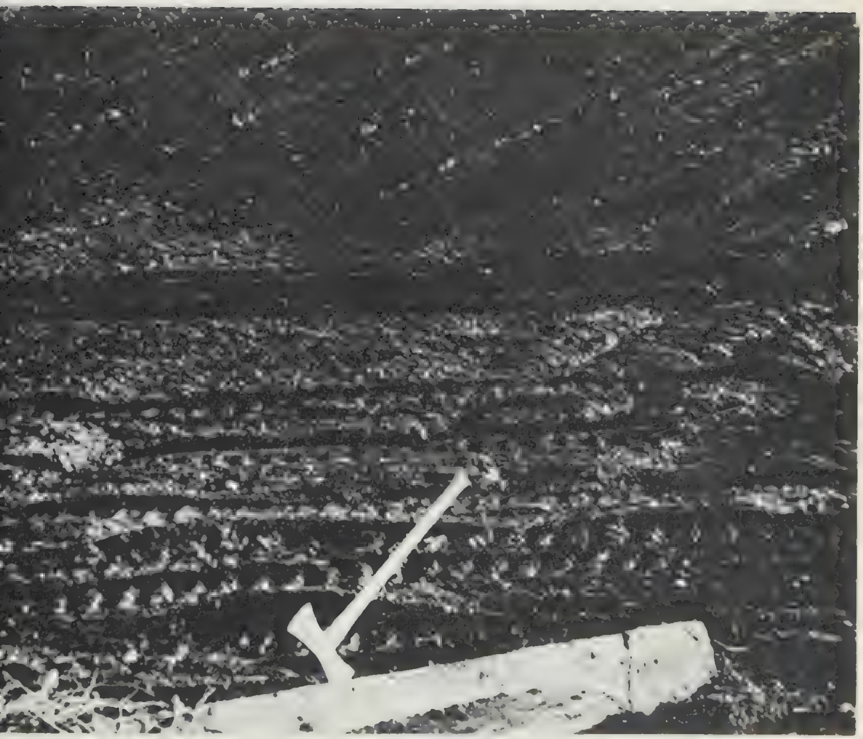
Can we not then farm the sea and make it grow more fish? If so, nobody knows how; few are trying to find out. It probably cannot be done anyway. After all, life in the sea has been growing and changing for billions of years, trying to make the best possible use of the sun's energy. The natural life of the sea – only two-fifths that of the land – is likely to be the most the sea can ever support. We cannot hope to do better, and at the rate we are pouring poisons into the sea we can expect to do much worse. Some people have said we should treat the sea like a huge factory and make great changes in it – heat it, bubble air through it, stir it, put in chemicals to make its plants grow better. In the light of what little we know about the sea, all such ideas are dangerous fantasies, the sooner forgotten the better.

Toivo Hypén: FISHING

Plastic food for plastic people

It may seem just as much like science fiction to talk about feeding people with algae grown on sewage, or with bacteria grown on oil; yet these things can probably be done, and a few people are trying to do them. The trouble is that people have been trying hard for many years to get starving people to eat new kinds of food much less strange than these, and they have not succeeded: people just do not like to change their habits. Besides, poor people have no money with which to buy food. Food made in factories, whether from things we are running out of (like oil) or from things we have too much of (like sewage), will be even more expensive than food now grown in the fields, and it is not clear at all how poor people will be able to afford it. Nor do we have the knowledge, factories, or money to make a lot of this synthetic food quickly.

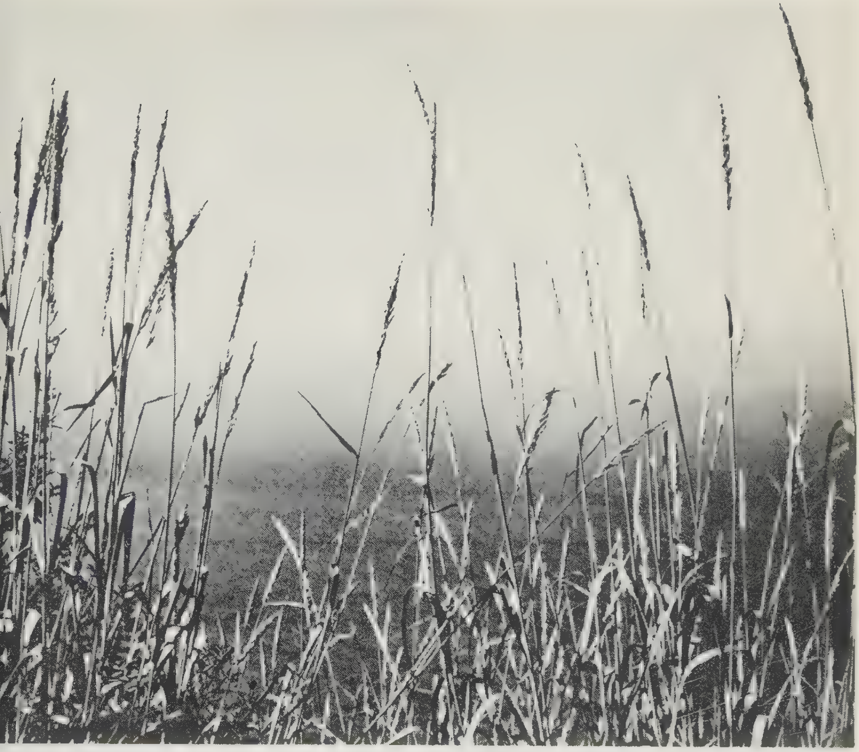
If we cannot solve our food problems by growing food in new places – unfarmed lands, the sea, or factories – then all we are left with is trying to grow more food in the same places, trying to use fertilizers in place of land. This is now being tried, both by adding chemical fertilizers to poor soils with normal crops and by growing new kinds of plants (the carefully bred crops developed in the 'Green Revolution') in order to increase the amount and quality of food that can be raised on each acre of land. These methods have helped raise more food – this is the only reason why we are not even worse off than we are – but there is a catch to it. There is always a catch to it when you try to improve on nature. In this case there are many catches, and here are some of the bigger ones.



Minor White: AX AND PLOUGHED FIELD, OREGON

The first problem with turning land into a chemical factory is that it takes a lot of chemicals. This is because while you can breed a new kind of rice or wheat, you cannot also design a whole new system of other plants and animals (including the tiny ones in the soil) to go with it, so your new plant must get most of its energy and minerals not from the natural processes of the soil but from fertilizers. This is very hard to do, for by harvesting a crop over and over – perhaps several times a year – you are preventing its organic matter from returning to the soil (as it would in, say, a forest), so the soil has less humus and does not feed the plants as well. The amounts of fertilizer needed to make the plants grow well in this way are enormous; the amounts we use are doubling or tripling every ten years. At the rate we are going, in the year 2000 about three-quarters of the world's people will depend on manmade nitrogen fertilizer (compared with one-sixth now) – fifty million tons of nitrogen a year. And to produce this much fertilizer needs, for a start, over fifty million tons of steel – for making the fertilizer factories and other machines – plus a quarter of a billion tons of coal a year or its equivalent in energy.

The fertilizers and pesticides that the new crops need are quite costly, and they are addictive: once you start using them, you harm the natural workings of the soil, and you must then use more chemicals each year to try to do what the soil used to do without cost. Also, if you want to grow your crops even more intensively, you need a larger extra amount of chemicals for each step up in production – to double your crop you need six or seven times as much pesticide. Once poor countries have come to depend on these chemicals to stave off instant famine, they are locked into the industrial and economic system of the rich countries, whether that is good for them or not. They are also more dependent on minerals than they were – not just the minerals needed to build the machines, but also the ones used to make the chemicals. Because there is little phosphate, for example – not even enough to last until 2030 – the rich countries are getting about five-sixths of it for making their own phosphate fertilizers, and the poor countries cannot afford to buy it. In a recent year, farms in the Federal Republic of Germany (sixty million people) used twice as much phosphate as India, Pakistan, Bangladesh, and Indonesia combined (over 700 million people). Likewise, if each Indian used as much fertilizer as each Dutchman, India would use almost half the world's present fertilizer production.



Edward Weston : GRASSES BESIDE THE PACIFIC, CALIFORNIA

Chemicals spread on land do not all stay there. Much of the fertilizer or pesticide washes away into your drinking-water, rivers, lakes, and seas, where it does great harm. And some pollution runs the other way, to the land, for many of the new crops need irrigation. Rainwater is distilled and has no dissolved salts – it is pure – but irrigation water is not. The salts can build up in the soil until nothing will grow. This is one of the reasons why the Fertile Crescent – the Tigris–Euphrates area – is not as fertile as it was, and why parts of the rich Imperial Valley of California have had to be abandoned. Salinization is a major problem in many parts of the world and is very hard to combat.

Another drawback of chemical farming is that it needs more machines and fewer people than traditional methods do. In rich countries this sort of change is sometimes thought to be a good thing, but in poor countries it means that many people lose the only way they have of earning enough money to buy food. In many poor countries, machines have cut the farm labour force by about half, and in the next few years there will be five or more new workers for every new job. Therefore the income of landless people living in the countryside has seldom risen (the landowners get the profits), so people are no more able to buy food than before. And if people cannot buy a farmer's bumper crop of miracle wheat, the price will drop, and then he can no longer afford to buy the machines and chemicals that he cannot now do without. More than half the jobs in the world are in or related to farming; that is too many people to find new work for if we replace them by machines.

Harold Null: PLOUGHING, FERTILIZER TEST STATION NEAR KANPUR, INDIA
FAO Photo

Redesigning nature

The biggest problem with turning land into a chemical factory is that in the long run the land will not stand for it. The whole idea of using land as a place to spread out leaves in the sunlight – rather than as a complex living system that includes the desired crop – is wrong. To see why this is so, we need to learn a little about how living things work if left to themselves. We shall then understand better why man, who claims to have made the earth fertile, has in fact reduced the total amount of organic matter in the earth's land vegetation by one-third. His methods clash with nature's.

The constant trend of all living things is to become more diverse, to multiply kinds and styles of life, to spread out into every place and manner of living that there is. In every place where a living thing could possibly grow, from pole to equator and from sea-trench to mountaintop, you will find life there, specialized to make the best of its surroundings. Wherever there is life it usually comes in great variety. This happens simply because complex and diverse systems of living things are more efficient (use the sun's energy better) than simple systems; and in the struggle for the strongest forms of life, the most efficient always win.

Suppose you try to make a very simple system – a field, for example, in which you have killed everything in order to grow just one kind of living thing, say beans. (This is called a 'monoculture'.) You will find that all sorts of plants and animals – mainly fungi and insects – try to come eat your beans. Why? Because your beans store sun-energy that is not being used (until you eat them – and then you have two kinds of living things in your field, not one), and nature never wastes energy. The longer you try to grow just beans, the harder it will be, for other living things will be trying all the time to eat your beans, and they have more time and practice at this game than you. Your beans are a tempting target for all 'pests' (that is, things that eat beans), for any bean-eater that comes to your field will find there no enemies, but only its favourite food, and will go through your beans like potato blight through nineteenth-century Ireland. And even before the bean-nibblers succeed, your beans may die by themselves; for all living things depend on each other, and your beans depend as much on tiny animals and plants in the soil as these depend on your beans. (The bacteria, fungi, soil mites, insects, and other animals that live in the soil make up about two-fifths of the total weight of all land animals!)

Now, suppose you leave your beans alone and let them be eaten. The system will then start to become richer and more stable as natural controls take over. The things that eat the beans are themselves eaten by other things that are eaten, and so on; many of these plants and animals that came to feast remain to fertilize; your beans, if they are well suited to the soil and climate, will flourish, and so will many other forms of life. If you wait long enough, your field will become jammed with thousands of kinds of living things - it will tend to become what is called a 'climax community' – that is, it will be the most diverse and stable group of living things that, in the course of evolution so far, could possibly grow in your field. It will probably be a dense forest, the most varied and productive kind of community; it is a measure of nature's staggering variety that in a tropical rain forest there are over *three thousand* different kinds of woody plants with trunks or stems at least a hand's-breadth thick. Such a diverse and complex system of living things will support a greater total amount of life than could live on that land in any other way, and perhaps twice as much as a farmer could grow there. That is what 'climax community' means and why it is there: every other system is less efficient and cannot compete with it. That in turn is why the earth's forests, covering only one-third of the land, produce two-thirds of its total crop of living things.

What are the lessons of this example? First, that there is a basic limit to how much you can increase farm yields, for you cannot get more living matter from the land than grew there before man came to it. This is because you cannot invent plants that will use sunlight more efficiently than natural plants do – for they are already doing as well as basic plant chemistry allows. Secondly, farming means growing only a few kinds of plants and is therefore an attempt to cheat nature, to work against its trends. Even if you succeed (by rapid rotation of crops) in fooling nature into thinking all the crops are growing at once, you will still be pushing against, and straining, nature's resilience. If you push too hard, you will make the soil and its living things poorer and less able to help your plants grow than before you started. At first things may seem to be working well, but later the yields will start dropping steadily. Finally, the use of pesticides is a losing battle, and you will need to use more and more of them with less and less success.

Getting hooked

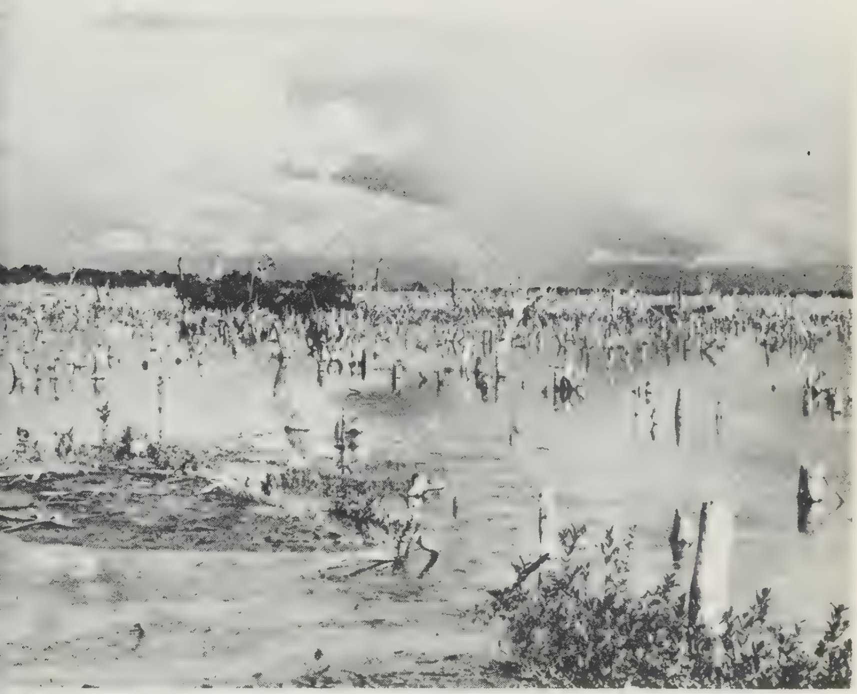
This last problem arises not only because 'pests' learn to resist pesticides as bacteria resist modern drugs, but also because pesticides generally harm the pests' natural enemies more than the pests themselves. There are three reasons for this: first, that the enemies are often more sensitive to poisons, for they are more highly developed and more complex animals; second, killing pests deprives their enemies of food, so the enemies starve and take a long time to recover their former numbers; third, long-lived poisons build up in the bodies of animals that eat other animals, so that birds (for example) are likely to build up higher levels of pesticides in their bodies than are in the insects they eat. So pesticides tend to kill the natural enemies of the pests, which meanwhile become resistant to the pesticides. In this way, many kinds of insects that were not pests before come to seek refuge in pesticide-treated crops *because their enemies cannot survive there*, and you soon have more pests, in both kinds and numbers, than you started with! As these new pests become resistant, you will need more pesticides, and the whole cycle will repeat, so you will have to run harder to stay in the same place. Thus farmers sometimes find that while they are using more pesticides year by year, their losses to pests are actually rising.

Nature has worked well for a long time without pesticides, simply by having very strict natural controls – at least 99% of the world's insects that could be plant pests are in fact controlled by their natural enemies. There are about a hundred kinds of land animals that could eat each kind of plant, but most plants in nature fall to the ground uneaten (to enrich the soil through decay). It is natural balance that keeps the plants from being wiped out. In an old forest, too, there are insects that can eat all the leaves off the trees, but if the forest is undisturbed, you will rarely find (on average) as many as one insect in each tree, for natural balance limits the number of insects. Trying to do better than this balance can do upsets it, so you have to try harder to take its place, and it is upset even more: it is a vicious circle, and ends with everything going wrong.

U. Jeffree: BEETLE

In short, nature generally knows best. A balanced system of living things is a little like a finely adjusted watch, made with care by people who know all about watches. If you poke a pencil into the works, you might make it run better, but it is much more likely that you will upset something delicate and make it run worse. In just the same way, meddling with natural controls usually doesn't pay. But people who make money out of pesticides think otherwise and are strong in many governments. It is ominous that the rich countries, already 'hooked' on pesticides, are spreading the addiction to poor countries and to the managed forests that cover a tenth of the earth's land area.

Behind all these statements is the basic law that the more varied and diverse a system of living things is, the more stable and resistant to change it is, while the simpler it is, the more easily it is upset and the less it can adapt to change. Natural systems of living things tend to be complex and a bit elastic – that is, they can stretch to survive the ordinary stresses of weather, disease, and so on. As we simplify these systems they become more brittle and shatter more easily; thus a forest of chestnut trees is destroyed by a chestnut blight that a mixed forest would survive. Man's drastic simplifying of many natural systems – especially the great forests of the world – is therefore dangerous to man; how dangerous we are only just beginning to find out. And in tinkering with nature's fragile and carefully evolved balances, we are not even bothering to keep all the pieces! We may not realize what they do until we try to work without them. If we kill all the insects on a farm, what will pollinate the flowers? If we kill the soil microbes, how will all the minerals be properly cycled – another service we now receive free? If we take more organic matter out of the soil than we add as humus, what will our crops be made of? If we keep raising sheep on a moor and sending them away to market, how can the soil replace the calcium that the sheep gather and take away in their bones – calcium that, if the sheep died on the moor, would return to the soil?



Harold Null: FOREST KILLED BY SALINITY RESULTING FROM BUILDING OF THE SALAMANCA HIGHWAY, COLOMBIA. FAO Photo

In diversity is strength

There is another and subtler danger in making living systems simpler. Life's ability to adapt to change depends on its being able to call on a great reservoir of variety in the genes. Just as people are different, and in a big crowd you can find someone with the ability you need – a born leader, say, or a mathematician, or a singer – other animals and plants, too, differ from one to the next of the same kind, and some resist certain pests and diseases better than others. Instead of keeping many different strains of plants alive, as nature does, we are breeding all our food crops to be just the same. But then a single attack can sweep through them like wildfire, as happened to the Irish potatoes, which were descended from only a very few strains of the old breeding stock of wild potatoes. (More than a million people died in the Irish potato famine.) It was in the same way, too, that a disease called phylloxera killed the grape-vines of Europe many years ago. If there had not been vines in America that happened to resist the disease and that could be used to re-plant vines in Europe, there would now be no wines in the world younger than about 1910. This sort of example shows how we, who think we are the most important part of the earth's diversity, are also the most dependent on it. Of the three hundred thousand higher plants, we rely on only six hundred, of which a mere hundred and fifty have international importance. Indeed, our base is even narrower, for only *fifteen* kinds of plants provide most of the world's food crops. A failure in any of these crops would be a disaster.

There is another side to this problem of genes: the Green Revolution crops are genetically unstable; that is, these carefully bred plants keep trying to change back to something else and to lose the high-yield, fertilizer-sensitive properties for which they were bred. But if all the places where the original pure breeding stocks run wild become settled, as is happening very fast, scientists will have nothing to begin with and will no longer be able to re-breed the special strains for farming. Without plant breeding, agriculture will collapse. Some scientists are very worried about this problem, and it is clear that urgent action must be taken to protect a varied stock of wild plants for breeding. The same is true of wild animals too. In both cases, economic growth in farming makes poorer the genetically rich ancient stocks on which the future of farming depends.

Heinz Jagusch: RED DEER IN SNOWSTORM

Grow now, pay later

Finally, what are we doing with our chemical farming? We are merely changing the energy of oil and coal into the energy of food crops – trading the sun's energy of long ago for land now, converting one form of energy into another. This is already done so much that a common food crop will often give less energy as food than was added as machine-work and chemicals to make it grow. These new supplies of energy do not – cannot – make the plants convert the fixed amount of sunlight to food with less loss than before; all they can do is to try to force the diverse patterns of nature out of their stable path, to produce a single crop faster and on less land than before. The more we try to do this, the harder it becomes and the greater are its side-effects; and even if we pour in huge amounts of energy, we shall not increase the earth's basic ability to produce food, nor solve the urban drift, unemployment, and other social problems that intensified farming brings.

Yet all efforts to support economic growth, feed more people, and mine more minerals need very large amounts of energy – amounts that are now *doubling* every twelve years or so. (This includes all forms of energy harnessed by man worldwide – coal burned in steel-mills, gas burned in home cookers, oil burned in cars, water-power driving turbines, and uranium atoms split to make heat for electricity.) Already man is using so much energy to drive his industrial empire that if the same amount of energy were in manpower instead, it would give more than a dozen slaves to every person on earth! (This is especially startling because it is an average for a world whose industry is very concentrated. The USA, with 6% of the world's people, uses a third of the world's energy – enough to give every American the equivalent of about a hundred slaves.) It is this immense breaking away from living within the limits of the sun's energy, as other living things do, that is at the root of man's abuse of the earth.

Harold Null: OIL RIG, LAKE MARACAIBO, VENEZUELA. FAO Photo

The sun supplies a great deal of energy to the earth, but this energy is spread out over such a large area that there is probably no way to collect large amounts of it except by man's two presently used methods – agriculture and hydroelectricity. Many countries have already built large dams in most of the places suited for them, so with dams, as with agriculture, we are not far from the limits of what can usefully be done. The way hydroelectricity works sounds as though it should last forever – sunlight changes water to a vapour, it falls as rain on the mountains, and the rain running back down to the sea is caught and fed through a turbine – but as we have seen elsewhere, tampering with nature never gives us something for nothing. Dams do not last more than a few hundred years before filling up with silt that makes them useless and costly monuments. This silt would normally have enriched farms downstream, so crops yields may suffer – as in the Nile valley below the Aswan High Dam, where the new dam-made breeding grounds for disease-carrying snails have also caused a serious health problem. Dams also waste water, uproot people, and harm the patterns of life in large areas downstream.

Dams are so big that they seem important, but in most countries they are not, and they supply only a fortieth of the world's energy. Nearly all the rest comes from the burning of fossil fuels (coal, oil, and natural gas) – the remains of ancient sunlight trapped in various plants that, instead of burning slowly in decay, sank into the warm ooze of an earlier world and were buried. But there is only so much fossil fuel, only so much hundred-million-year-old sunlight in storage. We have already seen how quickly our reserves of oil are vanishing. Natural gas is going even faster – if we keep doubling our use of it every six and a half years, it will not last twenty years. (Yet the present price is so low that the gas in the Nigerian oilfields is simply being burned off, for nobody will bother either to sell or to store it!) Coal can last much longer – perhaps even two hundred years if we are willing to tear up many beautiful or settled areas in order to mine it. But nothing is free, not even this rich energy capital laid down long ago by the sun, and burning our capital must be paid for.

arold Null: PETROCHEMICAL PLANT NEAR LAKE MARACAIBO, VENEZUELA
FAO Photo

We all know of the air pollution caused by burning coal and oil – pollution that can kill people and that is fast making the cities of the rich unlivable. Most – not yet all – kinds of air pollution from fossil fuels can be cured, but the price is high and so far nobody seems willing to pay it. Yet there is also another, much longer-term, danger of fossil fuels that we cannot avoid except by not burning them at all – the building up of the rare gas carbon dioxide in the air. By the year 2000 we shall have increased the amount in the air by nearly one-sixth – an important change because the earth's temperature is very sensitive to changes in the level of carbon dioxide. If we burn all our fossil fuels – which is unlikely, since industry will stop long before that because of running out of raw materials – we can even double or quadruple the amount now in the air, though this would take more than a few decades. Nobody knows how long we can get away with adding carbon dioxide to the air, but some people now guess that we may be in serious global trouble with climatic changes if we keep burning fossil fuels as we are now doing for another fifty to eighty years. One cannot be more exact until we know more about climate; but the problem is there, and if we shall have to stop using fossil fuels we must know as soon as possible, for it would take us many decades to adjust to such a profound change.

Because of the problems of fossil fuels – falling reserves, air pollution, and climatic effects – most governments think we should shift to nuclear reactors, which are now being built in many countries but do not yet supply a significant amount of energy. It is possible that nuclear energy may not cost more than energy from fossil fuels – if, as has been done so far, the public pays for developing the nuclear industry and insuring against its mistakes. But although nuclear power is often called 'clean', it is in an important sense very dirty, with invisible rather than visible pollutants, and brings with it new dangers much greater than any from fossil fuels. The common reasons for opposing nuclear power plants, such as the enormous amounts of waste heat they give off, are important but are not the best reasons. A better reason is that nuclear technology is too young to have solved all its safety problems, and at least one very serious problem remains unsolved – how to keep a certain popular type of nuclear reactor whose main cooling system fails from overheating and spewing deadly materials into the air. Such an accident is unlikely but could be a major disaster.

Even if this problem can be solved, which is not at all certain, we shall still be as far away as ever from knowing what to do with the nuclear wastes that all reactors make in great plenty. As we said earlier in talking about ocean pollution, some of these wastes are dangerous to all life – both the living and the unborn – and must therefore be kept apart from life for a very long time, as long as a thousand years. Many people have tried to figure out how to do this, but so far nobody has done so, and the problem may have no solution. Meanwhile, dozens of reactors are still busily making the wastes in the hope that somebody will solve the waste-storage problem in time, and many countries are committing themselves to nuclear power without worrying about whether their wastes can be safely stored: it is a problem that, like population, people want to ignore.

How about nuclear fusion – the way the sun works, the process that is fairly safe and that burns a fuel (extracted from seawater) of which we have a thousands of years' supply? Fusion is the best hope we have of a fairly 'clean' source of large amounts of energy (though it too would make some nuclear wastes), so it is partly what we have been looking for. The trouble is that nobody knows quite how to make it work. If we spend a lot of money finding out, we may have fusion working in twenty or thirty years – or, if the problem turns out to be harder than we now think, perhaps we won't. But right now we're not really trying. Instead of doing research on fusion, the nuclear countries are spending nearly all their nuclear-research money on making new fission devices called fast breeder reactors, which can convert an otherwise useless kind of uranium to a form that normal fission reactors can use as fuel. Fast breeder reactors are already here, not just guesswork, and we need them soon if we are to have many normal fission reactors, for without breeders we shall run out of uranium fuel in ten or fifteen years. But there is still much doubt whether we ought to have any fission reactors at all before their safety and waste-storage problems are completely solved, if this can be done; and breeder reactors could cause far more lethal accidents than normal fission reactors, which could themselves kill millions of people (though they are rather unlikely to). The decision to spend money on breeder reactors rather than on fusion research is a mistake made by men whose money and political power come from the fission industry, but it is not too late for the decision to be changed. Some scientists think it must be changed because, on grounds of danger, breeder reactors could be the greatest mistake in mankind's whole history. It is not clear that anyone has yet proved these men wrong. And the plutonium in breeder reactors remains deadly for so long that only half of it will be gone after twenty-five thousand years.

The ultimate limit

All our present sources of manmade energy, then, have some faults and bring some risks. Yet even if, in some way we cannot now imagine at all we could invent a perfectly safe and clean source of energy – solar power would be the answer if we could do it over large enough areas – we would still be defeated by a simple property of the round earth – a property that should make us doubt the world's present energy policy, namely that of increasing supply rather than controlling demand. This property is simply that the earth's delicately balanced climate can absorb only so much extra heat before it changes too much for us to stand. All the energy we ever use, no matter how, ends as heat; this is a law of physics and has nothing to do with technology, politics, or economics. Since everything must go somewhere, our manmade heat must not be greater than is safe for the world's climate. What is safe? Nobody knows; people have just started to think about this problem, since it was only recently found out that climate is more delicately balanced than we had expected. The guess that most scientists who study climate are making now is that if we keep doubling our use of energy every twelve or thirteen years as we have been doing lately, we shall greatly upset the world's climate with our added heat in less than a hundred years, and quite possibly in about fifty. In other words, the energy doublings that take place early in the next century may be the ones that get us into trouble. It seems almost certain that once we put the earth's climate far out of balance, we could not change it back again: major climatic change, like an avalanche, is easier to start than to stop. And we can already see local and regional effects on climate from our waste heat, mainly in cities; in New York City's Manhattan Island for example, the ground already receives about seven times as much energy from man as from the sun.

Here, then, is perhaps the ultimate problem of the commons, and one that new technology, however clever, cannot get round: how can we make

illiam Garnett : SMOG

sure that we do not use too much energy? With every country's wealt depending on how much energy it uses, this is a tough problem. Even i scientists could set a firm limit above which we must not go – and w shall probably never understand climate well enough to set a very exac limit – how could we decide how much of this quota to give to eac country, and how could we enforce the rules?

Defending man's right to vanish

The heat limit that we are just finding out about, and the nearness o it – less than a century away – give the final blow to the widely held ide that if we have more and more high-energy technology, we can solve ou problems by desalting the sea, making the deserts bloom, making metal out of granite and food out of coal, and going further and further fro living within the limits of the earth. If there were no limit on cost, pollu tion, resource-use, or (most important) energy, all these things could i theory be done, though at a great and ever-rising risk. But with a hea limit – the final limit of industry, from which there is no escape – suc 'energy-intensive' solutions, on anything like a world scale, are simpl not on, not because we shall never have the energy, but because we shal have no place to put the heat that the energy turns into.

The heat limit must therefore bring us once and for all to terms wit the roundness of the revolving earth. It must teach us the basic truth tha trying to make the poor richer by having immense growth for everyone i impossible – that instead the poor must be made richer by making th rich poorer, that is by spreading round more equally what wealth there i (though this says nothing about what sort of government is best for doin the spreading – so far capitalist and communist systems seem equally ba at it). Some people will not like the idea of redistributing wealth, bot within and among nations, but it is an idea that comes not from politics bu from the logic of ecology, and merely disliking it will not alter its logic And an utterly certain result of the heat limit is that making everyone i the world as rich as, say, an American is impossible, no matter how it i to be done. The earth is not big enough. The many people who are no planning as though this impossible task could be done will not like thi idea, but that cannot be helped. It is the truth.

nsel Adams: GRASSES IN RAIN, ALASKA

Seen in political terms, then, conservation is not a plot by the rich people to keep everyone else poor; on the contrary, it says that the rich are rich enough already, must not get richer, and should indeed be poorer. (The rich must take the lead by de-developing themselves – otherwise they cannot ask the poor to be satisfied with semi-development, rather than with cars and washing machines, for the poor will ask, with perfect justice, why the rich, who claim not to want these things, are still making and buying so many of them.) Thus conservation does not say that nobody must graze more than five sheep in the commons except those who are already grazing twenty. It says instead that those who have twenty sheep are causing most of the shortage of grass; that no new shepherds should be allowed in; and that all the present shepherds must agree on a more just and sensible way to use their commons.

Conservation also takes a long view: it is willing that people who are living beyond the earth's means in the rich countries' present Golden Age should have a lower material standard of living today so that people tomorrow will be able to have a standard of living at all. Thus it does not place our children's interests below our own; it is the denial of selfishness it is aimed at achieving the social justice that everyone wants, without so mistreating the earth that we cannot stay here.

Man's war with the earth is becoming dangerous to both, and it is time for a truce. The war has happened not because of any simple fault that we could set right if we were clever enough, but because of wants and social forces deeply rooted in man's nature, wants and forces that have caused all the problems we study in history. There is no easy way out. We need no less than a redirection of the course of history: a social change in which men of good will, convinced that there is no other way out, agree together to abide by the earth's terms. History does not help us much in deciding how to make this happen, for there has never been a now like this one – a now when our technology is for the first time limited by physical law, a now when it seems clear that the entire fate of our race rests on what we do in the next ten or twenty years, and a now that, if we fail, will probably become a never within a hundred years. Our survival depends on whether we can all realize in time the urgency of giving up some of our less important freedoms – the freedom to war, to pollute, to deplete, to breed, to abuse the commons – in order to keep the more important freedoms – the freedom to eat, to drink, to breathe, to live and love uncrowded and in

Ansel Adams: BURNT STUMP AND NEW GRASS, SIERRA NEVADA health, and to have grandchildren. If we are not to go the way of all 'mistakes' of evolution, we must learn to respect the system that worked so well for so long before man came to the earth, and that can help him to stay here.

THE STOCKHOLM CONFERENCE

One hundred forty-two shepherds have brought three billion seven hundred million sheep into a small green pasture, a free grazing-ground that is used by all in common. The grass is greener in some parts of the pasture than in others, and where it is greenest the sheep have grown enormous, with appetites to match. In the barer places the sheep are tiny, scrawny, and miserable; about half of all the sheep are like that. Each shepherd claims that his sheep are grazing only in the one small part of the commons that he claims as his own territory, but actually the bigger sheep are sneaking away and nibbling the grass all over the place, butting the smaller sheep out of the way. Most of the sheep are having lambs at an alarming rate. In many places the grass is cropped right down to the ground and the soil is washing away; the sheep are getting hungrier and are complaining loudly. Some of them are getting restless and starting to kick each other. A few of the shepherds see the grass disappearing, and they get worried about the future. What's to be done?

A man from the Shepherds' Benevolent Association wanders over, leans on the fence, and suggests that everybody get together and talk about the state of the pasture. Most of the shepherds say they're not interested, it's lambing time and they're too busy to listen. Many of them say this is really the problem of those with the biggest sheep – big sheep eat too much grass, and their shepherds, having caused this problem, should sort out what to do about it. Those shepherds say in turn that they have only a quarter of the sheep – the problem, they say, is really caused by those who keep very large and fast-growing flocks of small sheep, and everything would be all right if those flocks were reduced. Several of the big-sheep shepherds also say their cousins sell a wonderful fertilizer that will make plenty of grass for everyone. They know it works because they use it themselves, and there are special rates of interest for anyone who wants fertilizer on credit. Some shepherds whose sheep are starving say they want the fertilizer now, and while they're at it they want their sheep to be as big as anyone else's, so they can compete for food on an equal footing; indeed, it wouldn't hurt to have lots more sheep, to make up in numbers what they lack in size. Some of the big-sheep shepherds reply to this, 'You really don't want a lot of big sheep – that's what I have, and I can tell you they'll only make you unhappy.' To which the small-sheep shepherds, nodding sagely, say, 'Well, maybe so, but I notice you've just bought a lot of new sheep bigger than ever, so you must be getting something out of them.' To which there is no answer. Still other shepherds, while they replant grass – one seed at a time – say they think a committee should look into the whole question and report back in ten years. And while the argument goes on – louder and louder, to be heard over the baas – nobody speaks for the pasture, which is quietly turning to desert.

Nobody, you think, could possibly be that stupid. Well, not exactly nobody. You and I are the sheep and our governments are the shepherds, and all this has been going on for many years, for we're all much more concerned with getting enough to eat today than with leaving anything for our children to eat tomorrow. Time is running out so fast that if we're ever going to keep enough green pasture to stay alive in, now may be our last chance to start. But this year there is a new turn to the whole ridiculous story, and maybe a crucial one.

This year, for the first time, all the shepherds have finally agreed to go to Stockholm, Sweden, at the invitation of the Swedish Government, and to sit down and talk to each other about the pasture. This is the first time such a thing has happened. Indeed, it is the first time most of the shepherds have ever had to think about the pasture – most of them have been too busy keeping their flocks together to look beyond their own noses. Some of them even said, 'What pasture?' when they got the invitation. And this is also the first time that anyone has put together a complete survey of the state of the pasture – a detailed report that everyone will probably agree gives a fair picture of how healthy the grass and the sheep are in various places. From 5 to 16 June 1972, about fifteen hundred shepherds (each speaking for an average of almost two and a half million sheep) will come together at the request of the Shepherds' Benevolent Association – the United Nations, the only group that all the shepherds agree to listen to. They will even pay some money to arrange this meeting – the cost, say, of one modern jet aircraft, and a smallish one at that.

But just think of the problems! All the shepherds speak different languages – there are five working languages; they don't agree on basic definitions of the words they are using; some of them want to go into a lot of detail using numbers, while some want to discuss general ideas in words; some want to put into effect solutions so narrow as to be useless, while others want solutions so broad nobody else will agree to them; some of the shepherds will want to put politics ahead of the pasture by bargaining, by threatening that they won't come to the meeting unless concessions are made first about something else; since each shepherd is interested only in his own sheep, not in anyone else's, the interests of the whole pasture may never get talked about; and while the shepherds argue all these points, the notes of everyone's positions, the comments, the studies, the proposals will all pile up and become a huge monster of paper, a monster whose bite means instant paralysis. (The number of pages each shepherd will have to read before coming to the meeting has been cut down from over 6000 to a mere 800 – a triumph of brevity as these things go, but still calling for changing quite a large forest into paper.) With all these problems, can you imagine the shepherds agreeing about anything?

Fritz Bayerl: COUNTRYSIDE

This means you

Well, they had better agree: there is no other pasture. We all live here, and we don't all want to die here sooner than necessary. And the problem is truly everyone's. Think how much we now depend on what is done far away. The air we breathe may contain chemicals added halfway round the world; our livelihood depends on resources from the far corners of the earth, and on decisions taken in many countries; the rich control more and can do more harm with one mistake, but the poor, since they have less, are less able to survive one mistake. When men in Washington decide a kind of fish contains too much mercury to be eaten, fishermen in the Philippines are put out of work; when the flow of Chinese tungsten falters, factorymen in Italy worry; DDT sprayed in Africa ends in penguins in Antarctica; the world is too small and interlocked for anyone to says its problems are not his. And the poor have the least cause of any to say they do not care what the rich do: it is the poor who lose the most future options when the rich buy their resources, it is the poor who will be asked to suffer most from the sonic bangs of the Concorde and Tupolev-144 aircraft (if anyone bothers to ask them), it is the poor who most need to do everything right the first time, for they have the smallest margin of error. No nation can afford to have a narrow vision of time or place: pretending other people don't exist, like staying blindly biased towards next Monday, is no longer good enough. We must all now look around and ahead to re-ask, in the new context of the earth, the ancient questions of politics: what is right? who decides? how? where does power lie? how much freedom can we give ourselves and still be protected from our neighbour's abuses of his freedom?

V. Lavrov: PENGUIN FAMILY

To see how hard it is in practice for countries to agree about even the most basic problems of the earth – except for not-so-useful places such as outer space and Antarctica – just look at some of the arguments that went (some months ago) into trying to draft a Declaration on the Human Environment, a paper everyone could sign in Stockholm to show they all agreed that it would be good to have a better environment. A working group of men from twenty-three countries struggled through sixteen meetings and finally came up with a draft text, but they still could not agree on many points. For example, Brazil, Czechoslovakia, and the USSR did not agree that 'excessive population growth could defeat man's efforts to preserve and enhance his environment' – they said this is a problem only in certain regions, while in other regions there is indeed a need to increase the birth rate. Argentina agreed that population is a problem only in certain regions; Ghana said population does not seem to be an environmental problem yet, though it might become one. Several nations did not agree that 'each State has the responsibility to exercise its sovereignty over its natural resources in a manner compatible with the need to ensure the preservation and enhancement of the human environment' – they wanted each nation left free to do exactly what it likes with its own resources, regardless of other nations' needs and wishes. Two nations objected to the principle that 'States shall carefully husband their natural resources and shall hold in trust for present and future generations the air, water, land and plants and animals on which all life depends'; they felt it hampered national sovereignty (the right of each nation to do just as it likes on its own land) and discriminated against the poor. Several other clauses of the draft were criticized as having an 'anti-development bias', for some countries were strongly in favour of more 'development' – though what they were to develop out of or into was not quite clear.

Now look at what happened when this fought-over draft, bleeding from every comma, came before an even larger committee. Some nations wanted the draft to be shorter, some longer, some more vague, some more specific, some broader, some narrower, some binding and some merely inspiring. Several nations felt that the draft contained ideas (about population control and resource-use) that weakened the principle of national sovereignty and could not, therefore, be accepted. National sovereignty, these nations said, is the only basis for international co-operation. Other countries, taking the opposite stand, said that instead of just saying what rights countries had, the Declaration should give them some responsibilities as well. And some countries, not merely attacking what the draft said, thought its wording was not inspiring enough and should be dressed up by a professional writer. In the end, the draft was sent back to the earlier committee, reconvened at a cost of about £6000 – but not before one country had proposed that the Declaration should consist mainly of a simple statement to which everyone could subscribe. He suggested this: 'The ultimate goal of mankind should be so to adjust the physical and biological condition of the biosphere, in so far as we are capable of doing so, that the human race can live now, and continue to live, with enjoyment of the greatest possible health and happiness.' This is almost a perfect digest of what we have foolishly been trying to do – adapting the earth to us, not us to the earth – and it is this man-centred state of mind that has got us into such a mess.*

What a silly lot of arguments! you may be thinking. Why can't countries stop arguing and get on with what has to be done? Well, the United Nations often comes in for this sort of criticism. People say it is nothing but a hot-air factory, a place for talk and papers but no action, a procession of the bland leading the bland. People say that if the UN cannot protect us from the known horrors of war, it has little chance of protecting us from the largely unknown horrors of pollution, resource depletion, and overpopulation. But the very fact that the UN helps people talk to each other is itself a great advance, for talking at least helps people's general beliefs to catch up with the latest thinking. Otherwise they might *never* get to hear what year it is. Besides, just being able to make speeches may divert nations from, say, wars: there is value in diplomatic ritual, and speechmaking may help to transfer anger from the battlefield to the conference-table, there to be vented harmlessly. The fact remains that the UN is the only body we have where all countries can and do talk to each other. Since we must somewhere make a start at getting everyone together, the UN is the best place we have, and it has already done what no other body has been able to do: get people to agree to talk about the earth. It is, of course, depressing that the sort of argument we have just looked at is the only way in which countries seem to be able to talk to each other about anything, but that is their fault, not the UN's, and so far nobody has found a short-cut.

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* If you want to see how the draft declaration on the Human Environment turned out in the end, complete with built-in contradictions, look in Appendix I at the end of this book.

In Stockholm, then, the 1972 UN Conference on the Human Environment will be the first contact between all the world's leaders to talk about the state of the earth. What do they hope to do? Can they consider broad long-term issues, or would those distract them from doing the simpler things that are nearest to hand? How international does conservation have to be? To see the answers to these questions, we shall have to look more closely at what the Conference plans to do and at what it ought to do, for if we are to make it easier for nations to work together, we must see what forces make it difficult.

To give some of the flavour of the Stockholm Conference, we have reprinted, in boxes like this one, about a tenth of the 150-odd action proposals that are to be presented at the Conference. The text of each proposal, printed in *italic type*, is followed by our comments, printed in plain Roman type.

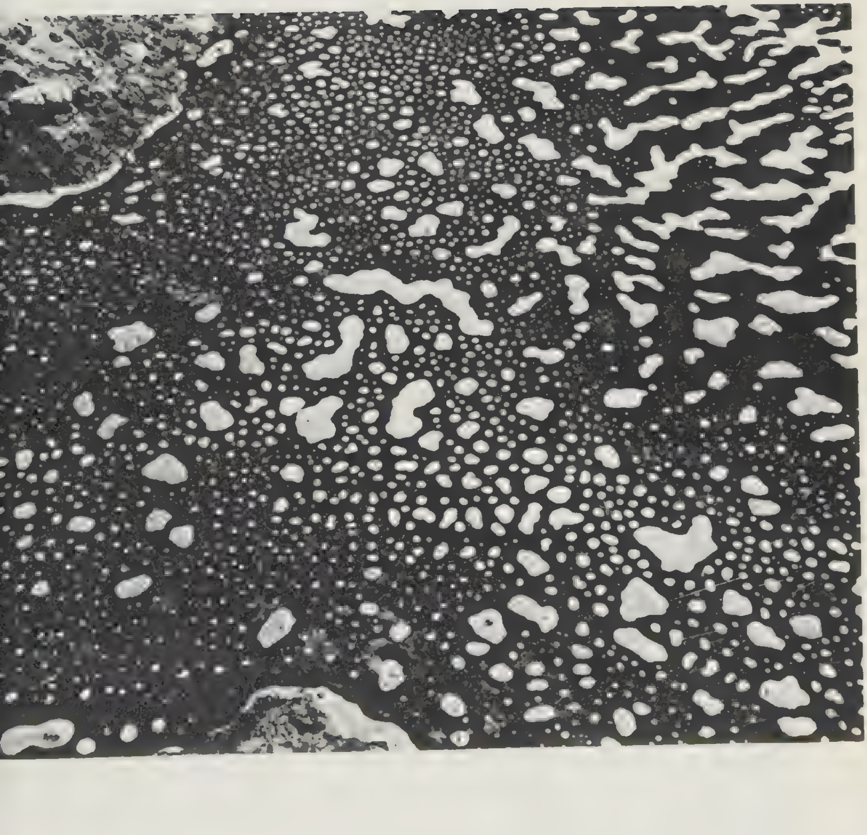
Ansel Adams : WINTER FOREST

Everybody's dustbin, nobody's responsibility

The oceans, one of our biggest and most endangered commonses, show at once the sort of conflict the Conference will face. On the one hand, the health of the oceans is clearly put in danger by the sorts of pollution we talked about earlier – chemical wastes, nuclear wastes, pesticides, sewage, oil, fertilizers, heavy metals. The problems are urgent: the Baltic is nearly dead, the Caspian and the Mediterranean are in a serious state, and the high seas are already showing signs of illness. And no country will deny that it wants the oceans to be healthy. On the other hand, all countries also insist that the ocean's edge is entirely controlled by the countries round it – each claiming some set distance as its territorial waters – while anything beyond that, out in the middle, is in nobody's care or power at all. These ideas are well settled in international law on which all agree. Here, then, is the conflict: that while nations will admit it is in their own long-term interest to control pollution of the seas, they will also not want to give up complete control over their own waters, nor to give anyone else control over what their own citizens do on the high seas. In short, international action, if it is to save the seas, must mean some loss in the freedom of nations to do what they like.

> *It is recommended that the Secretary-General, together with the sponsoring agencies, make it possible for GESAMP* [*the Group of Experts on Scientific Aspects of Marine Pollution*] *to:*
>
> *re-examine annually, and revise as required, its Review of Harmful Chemical Substances with a view to further elaborating its qualitative assessment of risks, pathways and sources of marine pollutants...*

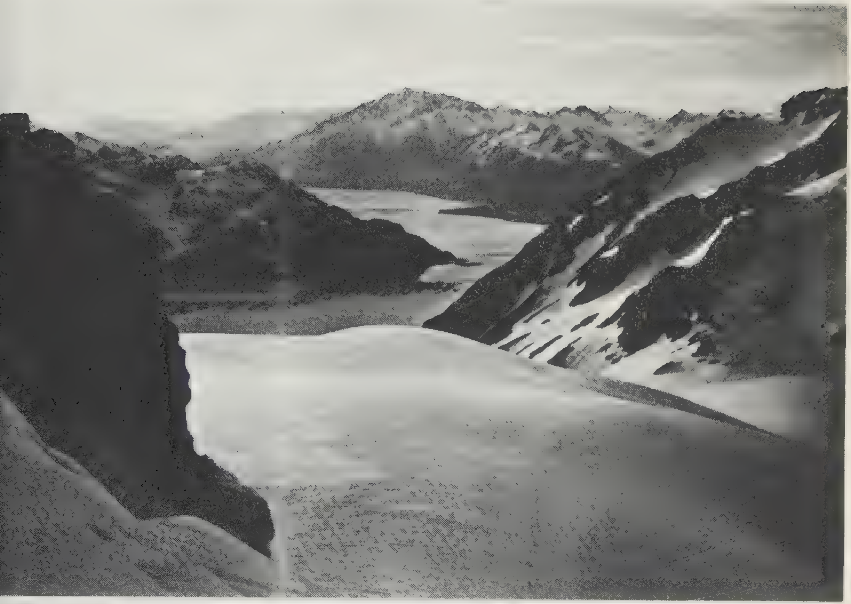
It may be that the worst pollutants are the ones we haven't discovered yet.



Edward Weston: FOAM AND SAND

Before the blue seas turn grey

The freedom of the seas has already caused countries to fall victim to oil slicks and other pollution floating into their waters from outside – from where outside they seldom know, for the spillage is on the high seas and nobody keeps track of what goes on there. Canada is especially prone to damage from this sort of pollution because the cold Canadian waters are ice-bound and stormy, and the rugged Canadian coast is slow-healing. Canada has finally got fed up with waiting for other countries to co-operate in protecting her coasts, and has partly taken the law into her own hands. Canada has passed a law saying that a very large zone outside the usual Canadian waters will now be subject to Canadian control of shipping, and that within this large zone Canada can do whatever she thinks necessary to protect her coast from damage by foreign ships. This law results from the failure of other countries to agree on a better answer to a problem that affects them all; and the law is causing a lot of argument, since nobody is quite sure whether it is proper (in law) or not. But clearly it would be better if all the maritime nations agreed to police themselves so that countries like Canada do not feel bound to do it for them in self-defence. Control of the dumping of wastes into the sea can come either through a system of licenses or through outright thou-shalt-nots, and countries are still not entirely agreed on which method is best; but it is likely that they will agree on one or the other at Stockholm and put it into an agreement binding everyone. This will be a great step in the right direction. Placing the high seas under international controls will come just in time – we are on the verge of large-scale mining under the high seas, and the scramble for resources in mid-ocean could cause major conflicts if it were not regulated in advance. Further coöperation may also come soon on specific technical points about shipping – for example, the one-fifth of the world's oil tankers that still do not use an improved method for loading their tanks are the cause of nearly all the world's non-accidental oil spills from ships, and this sort of sloppiness must be corrected.



ave Bohn: REID GLACIER AND TARR INLET FROM PEAK 4710. 1965

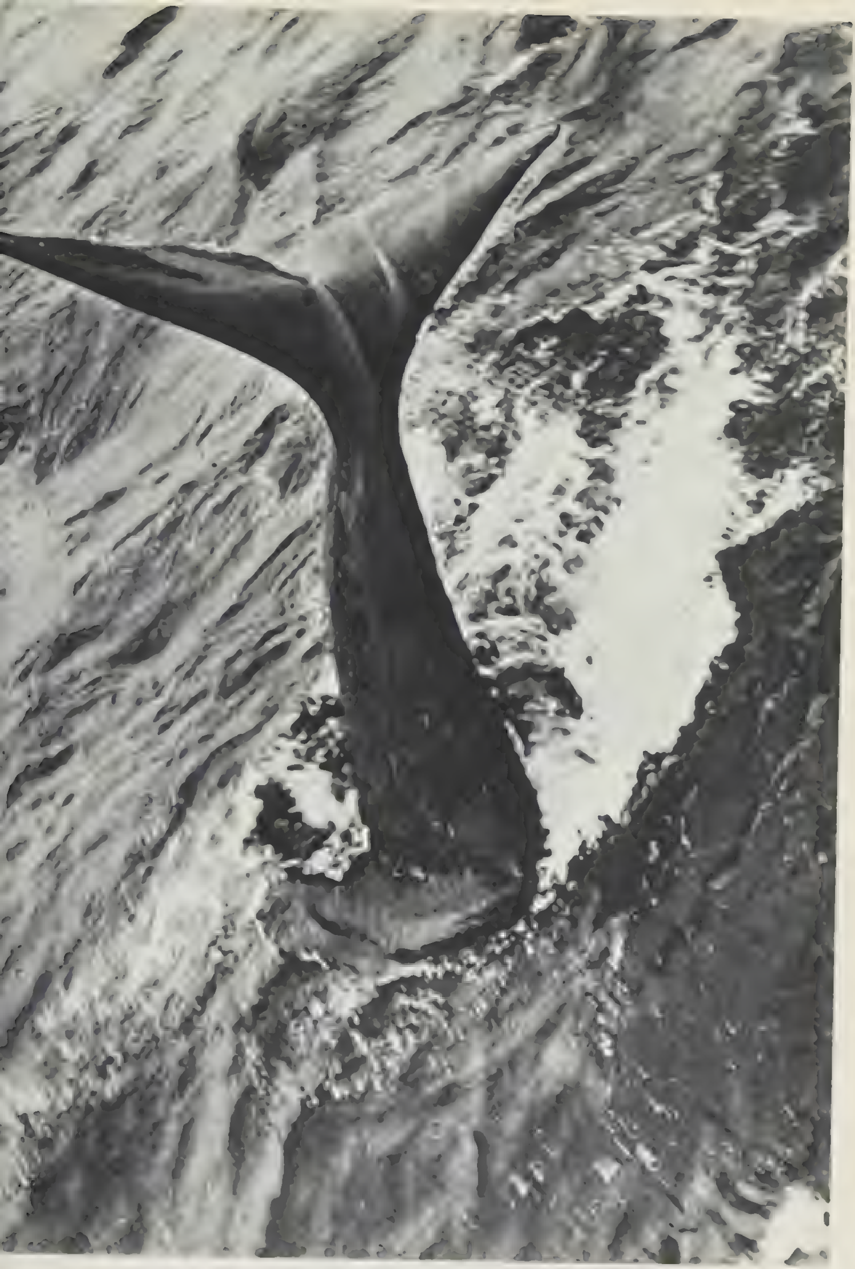
The organizers of the Stockholm Conference also hope that countries will sign there an agreement to stop the hunting of whales once and for all. There are few whales left to greet this belated news – we do not know, for example, whether there are now enough blue whales left in the world to build up their numbers again – but better late than never. ('And this time,' you can hear the International Whaling Commission saying, 'we really, really mean it.') The Stockholm Conference hopes that the few countries that still hunt whales will by now feel so ashamed of themselves that they will sign the agreement too; carrying out its terms will not cost them much but greed, especially since the other countries will probably agree not to buy anything made from whales.

> *It is recommended that governments agree to strengthen the International Whaling Commission and to consider an international agreement calling for a 10–year moratorium on commercial whaling.*

Undoubtedly this recommendation started off stronger but was watered down. We think the time has long since come for nations to stop considering a moratorium and actually to impose one as an emergency measure. To protect the whaling industry from unfair loss, general UN funds should be used to buy the world's working whaling fleet, put it in mothballs, and help the whalers to find new jobs. That's a small price to pay for having whales in the world.

Before the air hides the sun

The air, like the sea, carries pollutants all round the world in ways that we do not yet understand and have barely started to measure. Air pollution on a large scale is very often an international problem because the wind blows the pollution across boundaries; indeed, the first problem is often to decide which of your neighbours to thank for its little airborne presents. Sweden, for example, has been saying for some years that its forests are suffering from extra-acid rain caused by sulphur dioxide from



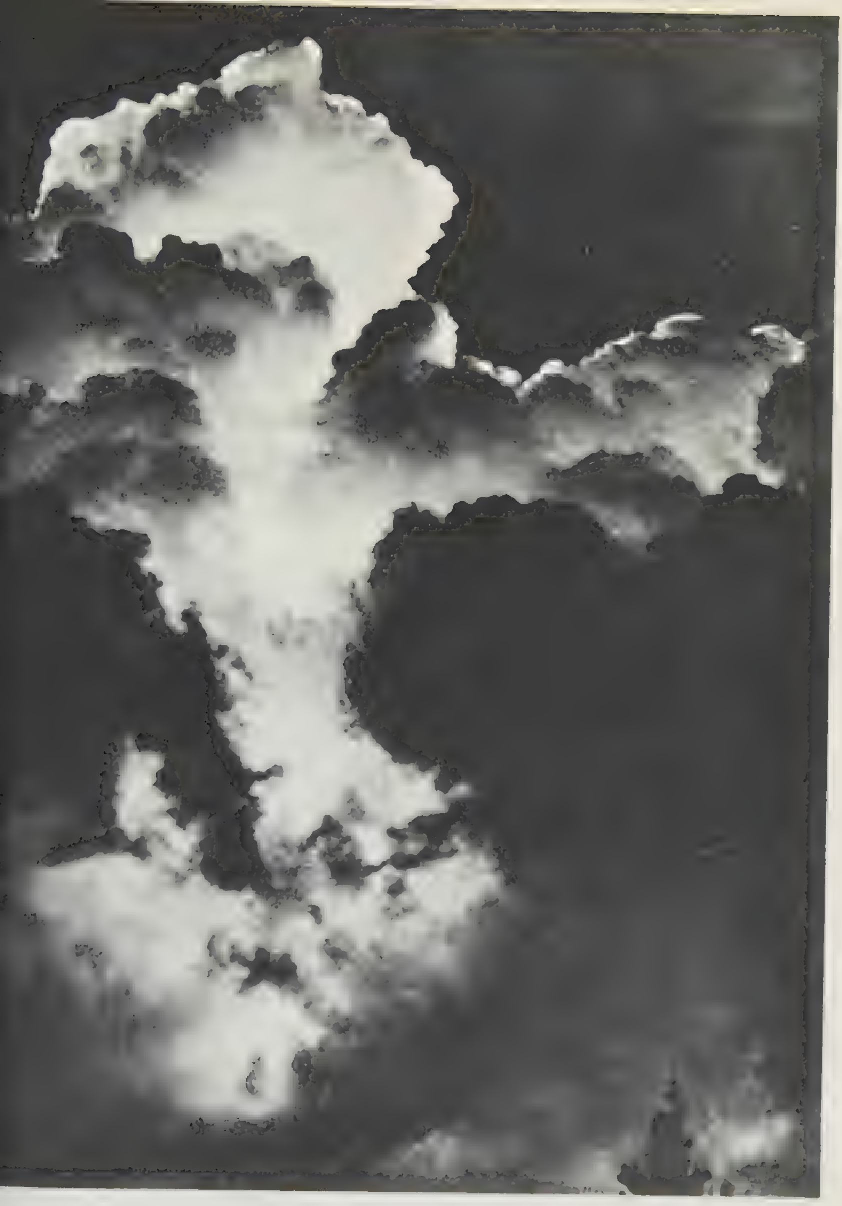
. Gippenreiter : WHALE

British power stations. The British say it *is* sad about the rain, isn't it, but the sulphur dioxide isn't theirs. In this and in hundreds of other problems – some regional like that one, some global – the first problem to be overcome is the almost complete lack of data. To fill this need, the Conference expects that countries will agree to set up a Global Environmental Assessment Programme or Earthwatch. This programme will include a network of stations where scientists from many countries can gather information about what is in the air and water, so that they can keep better track of what is happening and try to warn us of problems before they get too serious to solve.

> *It is recommended that Governments be especially mindful of activities in which there is an appreciable risk of effect on climate, and carefully evaluate the likelihood and magnitude of climatic effects and disseminate their findings before embarking on such activities....*

Despite widespread concern among scientists, this pre-examination is just what several nations have *not* done in developing supersonic transport aircraft - after all, they might endanger their investment. Will this recommendation make a difference? And once we have the information, what are we supposed to do with it? Should we be sure we're wrong and then go ahead? This looks a little like a recommendation that if we're going to do something disastrous, at least we should do it on purpose.

The Earthwatch scientists will be watching with special care the effects of man's pollutants on the world's climate. Man is adding to the air not only carbon dioxide, but also other gases, water-vapour, many kinds of organic chemicals, and dust – so much dust that man is in the same league as the world's volcanoes as a dust-producer (and major eruptions do change climate). The possible effects of disturbing the world's long-term climate are not a laughing matter. For example, the ice floating in the Arctic Ocean is probably in such a sensitive state that a general warming of less than a Centigrade degree, kept up for some years, could melt it. This in turn would change the weather patterns over the whole northern half of the world, and might help to melt the great Greenland ice-cap.



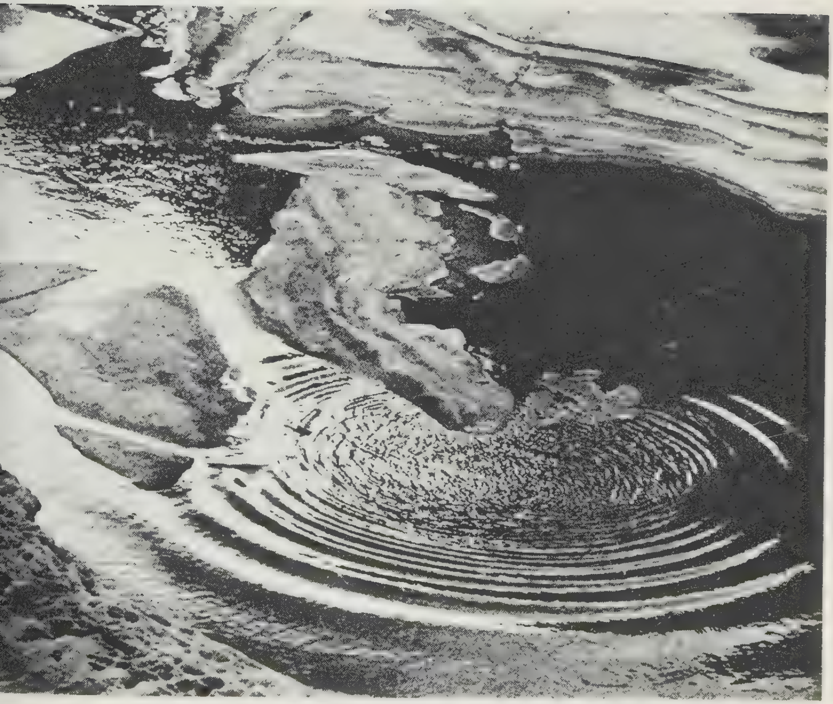
edric Wright : CLOUDS

This further melting, if it took place, would raise the level of the seas by about seven metres and would thus flood many major cities. Some scientists think that such a chain of events might be caused in the next century by man's use of large and rising amounts of energy, especially from fossil fuels. Certain kinds of changes in climate might also be triggered by changes in land-use over large areas – the cutting down of the Amazon rain forest, for example, or the widespread use of irrigation. Earthwatch, together with universities and other research bodies, will try to act as an early-warning system to help us avoid making big mistakes with the world's climate. Earthwatch will also let us find out what sorts of pollution are most urgent to control first, and whether proposed new kinds of pollution – from supersonic transport aircraft, for example – are likely to be safe or not. At the moment, everyone argues and nobody knows.

> *It is recommended that:*
>
> *approximately ten baseline stations be set up in areas remote from all sources of pollution, to monitor long-term global trends in atmospheric constituents and properties, which may cause changes in climate;*
>
> *WMO* [*the World Meteorological Organization*], *in coöperation with ICSU* [*the International Council of Scientific Unions*], *continue to carry out the Global Atmospheric Research Programme, and if necessary to establish new programmes, to better understand the general circulation of the atmosphere and the causes of climatic changes.*

There are no known 'areas remote from all sources of pollution' an more – at least, not on the earth or moon.

Just having better information, of course, is only the first step: we ar not acting fast enough now on information that we have had for year about, say, the effects of DDT. Unless we act on what we already kno or reasonably suspect, making changes feasible now and fixable later (i they turn out to need fixing), we may not get time to finish our research Thus GEAP, though very much needed, is only part of a larger process the first step in a long journey, and just because we are setting it up w must not think we have solved any problems. We shall only be findin out what the problems are. Solving them will cost even more tha GEAP – which will itself be so costly that nations may try to set up



Vida Strasek : SILVERSEA

skimped version that cannot do the job properly. (The cost of a proper GEAP, though, would be only a minute part of what is now being spent on, say, space travel, which is far less essential for our survival.)

> *It is recommended that the Secretary-General, drawing on the resources of the entire United Nations system, and with the active support of Governments and appropriate scientific and other international bodies – increase the capability of the United Nations system to provide awareness and advance warning of deleterious effects to human health and well-being from man-made pollutants. . . .*

A world watchdog mustn't be as lethargic as most UN agencies hav historically been; it must lead, not have to be pushed from behind to brin it up to date with changes in fast-moving areas of science. The smaller less formal review committees that scientists have recently organized fo themselves seem a much more sensible pattern to work on.

Genes: fifty million years to make, fifty years to lose

Despite these problems, the reason it will probably be fairly easy to set up GEAP is that doing so involves little conflict of interest. True, nations can say that giving information about their pollution may be useful to an enemy, but the flow of data will go both ways. GEAP is thus close to the perfect target for successful UN action – it is something everyone can agree on without having to give up anything (except a little money). Another such 'consensus' action – one that every scientist will agree is urgently needed – is the setting up of gene banks around the world, big collections of plant and animal matter carefully protected to preserve the genes in case the living things in the outside world are destroyed. This is a danger now that the ancient homes of wild things – the great centres of diversity in the forests of Africa, Asia, and Latin America – are being burnt and cut down for farming or mining. As the wild plants and animals of the world disappear, their rich variety of qualities (such as hardiness, ability to adapt to different climates and places, growth habits, range of sizes, resistance to different diseases) is being lost, and we cannot make this variety ourselves.

arl Dostler : REGAL

The world's dependence on a mere fifteen kinds of main food plants makes it so urgent not to lose the wild and semi-wild plants – like the yams of Western Africa – that the Stockholm Conference will propose a five-year emergency programme for discovering and saving wild plants. With large animals, too, we have not tried hard enough to use local animals for food, but have instead tried to raise Western European animals everywhere; in many places this has worked badly. If we are to do better, we shall need a wide range of native animals to start from. We must also not forget the tiniest living things – the micro-organisms that give us antibiotic drugs, enzymes, vitamins, and many kinds of food, and that are the basis of much fundamental scientific research. The variety of these micro-organisms is also being lost, and the Gene Pool Proposal to be put forward at Stockholm will help to keep this problem from getting worse. Trees and insects too must be included (forest trees are part of the five-year emergency programme), and every other sort of living thing: we must not throw away forever the genetic wealth that has taken billions of years to collect, and whose value we are only starting to realize.

It is recommended that governments . . .:

Make inventories of genetic resources most endangered by depletion or extinction.

Maintain gene pools of wild plant species within their natural communities.

Act with the understanding that evaluation and utilization are critical corollaries to the conservation of genetic resources.

This refrigerator? Ah, the Garden of Eden is in this one. We couldn't afford to give it room to grow, so in order not to lose it we put all the plants into cold storage. The Tree of Knowledge? We were going to save that one, but the bulldozers got there first.

eo Vrana: DRAGONFLIES

Every living thing is vital—but life on the shelf is a poor substitute

We must be careful to protect even those living things that do not seem to us to matter. If they did not have a task to do in nature, they would not be here, and we ought not to find out what that task is by seeing what goes wrong if it is undone. These tasks are often so marvellously complex that it is a life's-work to figure them out, and it is simpler just to avoid meddling. We often find new uses, too, for life that we are on the verge of destroying. In recent years, for example, a plant called the water hyacinth, introduced by some tourist who thought it looked pretty, has got loose on the rivers and lakes of Africa, and has swept over them like a plague, carpeting their surface with a jungle-like tangle, keeping the air out, suffocating the fish. What may come to the rescue? Not man, who cannot figure out an answer to the water-hyacinth problem but the manatee, or sea-cow, a gentle and harmless animal that is now almost extinct, hunted for its blubber. (It is one of the two hundred kinds of mammals now being hunted to vanishing point.) The manatee is so shy that when man is nearby it doesn't breed. If it can recover from our ruthless hunting, it may solve the hyacinth problem we have made for it likes nothing better than munching on hyacinths all day long.

We must also protect with special care the animals that we think are harmful, for they too have an important place in nature. In the USA, taxpayers' money is spent on killing wolves and coyotes because they are said to kill ranch animals (though the damage they really do costs far less than the attempts to wipe them out). But in fact the long-term cost of not having, say, wolves is enormous, for the other animals they hunt – everything from deer down to rabbits – get out of balance and must be hunted too if they are not to overrun the place. In such a case, it is worth keeping in mind that nature got on without man's 'controls' for a very long time. Thus it doesn't make sense to say that you must shoot the wolves so they don't kill all the deer; for if wolves eat so many deer, how come there are any deer in the world at all?

It is further recommended that governments give attention to the need to enact international conventions and treaties to protect species

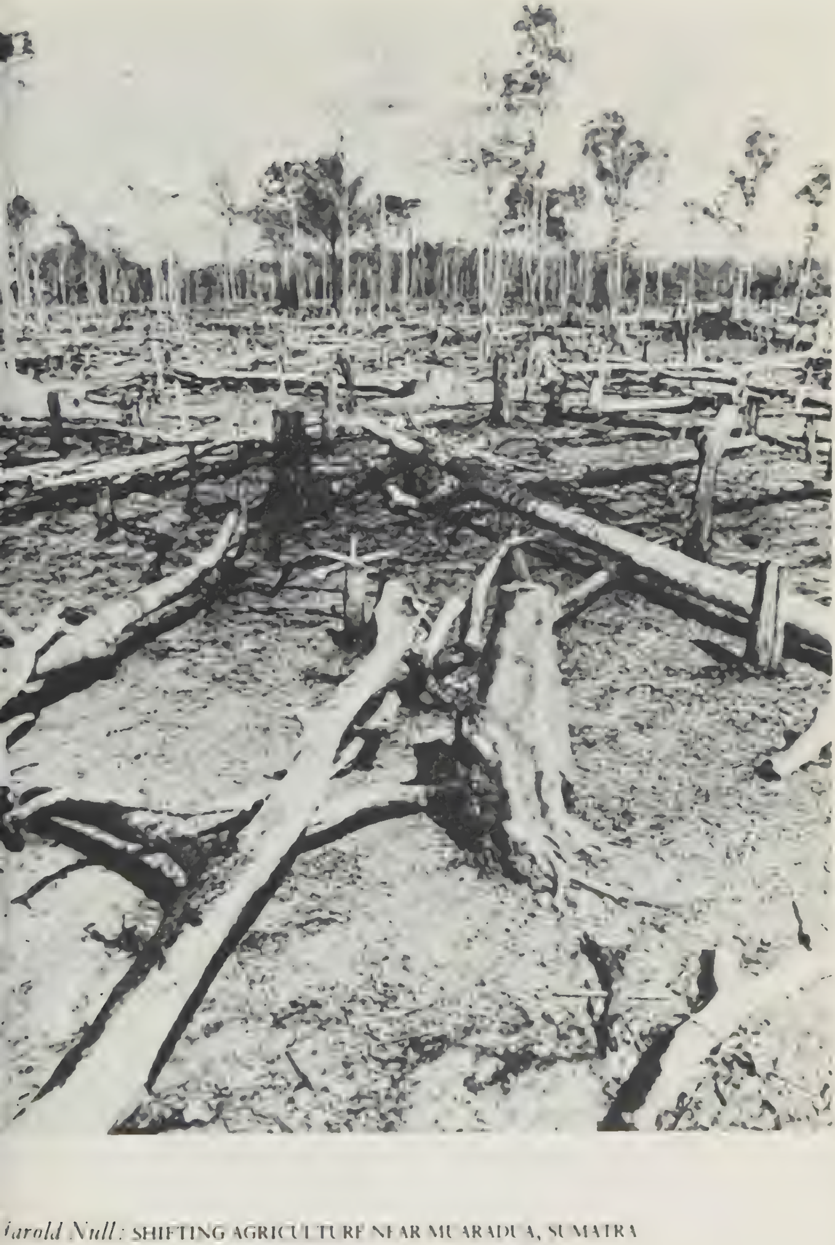
Vlodzimierz Puchalski : OTTER

inhabiting international waters or those which migrate from one country to another.

We know from whaling that this will work only if every country want it to work. If not everyone can agree about whaling, how can everyon agree about overfishing, where the danger is less plain? Will those wh profit most from greed really agree to stop being greedy? Right now, onl a few countries kill whales, but most countries – even Britain – bu products made from dead whales (and other endangered species), an thus support the hunters' greed.

Of course, keeping gene pools in the form of rows of tins on a shelf i a last resort. It is what you must do if you have failed in an even mor important task – to keep the plants and animals alive in their wild state all living in their natural relationships with each other, as in a wild forest It is when you ask nations to set aside not just plants and animals bu large tracts of land that they live in that nations are likely to start sayin they will do what they please with their land, thank you very much. Fo if they do not cut down their forests, they think, how can they farm an mine enough to feed their growing numbers? That the farming may no work (especially in the tropics) and that the minerals will go mainl abroad may not occur to them, and many people find it hard to see an great value in a wild and trackless forest – they think it's just sitting ther not doing anything, and since it doesn't have chimneys with smok coming out, it must not be doing useful work. Besides, many peopl like to chop down trees – it gives them a feeling of power over wil nature, of taming a dangerous beast and making it serve man. So man people like to chop down trees that the earth's forests – which cove about a third of all the land area and contain about half of all the world' living things, land and sea – are quickly disappearing. In Latin Americ alone, for example, forest covering an area about the size of Hungary i felled every year. In the Far East, a similar amount of forest is cut yearl for shifting cultivation. And when a forest in a tropical or subarctic are is cut down, it is very unlikely to grow back again in less than geologi time.

Much forest is cut for timber, pulp, and paper – the making of whic is a particularly dirty industry – and the demand for these things i expected to double by 1985, then double again by around 2000, clearl



arold Null: SHIFTING AGRICULTURE NEAR MUARADUA, SUMATRA
FAO Photo

hard luck for the remaining forests. How can we keep any? You cannot hope to persuade a logging company to spare a forest just by saying it is a valuable gene pool, or looks pretty, or makes the earth's weather and water cycles more stable, or helps control the flow of oxygen and carbon dioxide in the air, or protects and enriches the soil, or does anything but enrich the logger. All these arguments will not seem as strong to the logger as the lure of profit to be made from dead trees – the same problem we saw with whales, except that whales can swim while trees are fixed. But since seven-tenths of the world's forests are owned by governments rather than by private people or firms, the balancing of one use against another is supposed to be done not by loggers but by governments – and this responsibility of governments, too, will be talked about at Stockholm. Countries can also take much better care of the forests they have: in Europe, for example, trained people look after nearly all the forests, but in Latin America and Africa only about a fifth of the forests receive any care at all.

The arguments you often hear for and against cutting down a forest in, say, a European country are a good example of the muddled thinking that is common in making national decisions. Usually the sale price of the timber will be balanced against, say, some small value of money that is supposed to show the value of the forest to people who come to visit it. But if the forest's value as a system for supporting life – its many functions in protecting other living things, soil, water, air, and climate – were taken into account, it would be clear that the value of a forest that does all these things is really the cost of replacing it. For a common sort of forest in Europe, if you calculate how much sunlight and time (about a century) it takes to grow a stable new forest, you find that at present costs for energy, the stored sunlight in each square metre of forest is worth about £60!

It is recommended that the Secretary-General take steps to ensure that:

The UN bodies concerned coöperate to meet the needs for new knowledge.

Continuing surveillance of the world's forest cover is provided for through the establishment of an appropriate monitoring system.

It is further recommended that FAO [*Food and Agriculture Organization*]*:*

Coördinate an international programme for research and

yszard Taszakowski: LOGGING

exchange of information on forest fires, pests, and diseases.

Facilitate the transfer of information on forests and forest management.

Yet this does not tell us how to keep what is left of the earth's grea forests. If Brazil, in her national sovereignty, wants to chop down th Amazon Basin rain-forest, what are we to do about it? Forests survive for a long time without managers, but they won't last much longer withou guardians.

Beauty is old and looks best, well kept

This ability of nature to create very beautiful places by working slowl for a long time – places so beautiful that we could not possibly replac them – will be recognized in yet another agreement to be put forward a Stockholm – an agreement to set up a World Heritage Trust to protec the most precious wild places all over the world. Some will be saved t look at, some for scientific study as examples of how the world worke by itself before we started trying to improve it, and some as gene pool not to be disturbed at all. Places like the Grand Canyon, the Ngorongor Crater, and Mount Everest – and a few outstanding manmade place like the Taj Mahal and the Pyramids too – are so special that everyon will probably agree that they 'belong' not to any one country but to al mankind, and must therefore be protected for all men for all time Agreeing to do this may be a nuisance to a few countries in which thes treasures happen to be – it would mean, for example, that the Bureau o Reclamation could not revive its plans to flood the Grand Canyon wit needless dams – but on the whole it is likely that all the countries meetin at Stockholm will agree at least to a vague statement that they do inten to protect these special places from destruction by buildings, big roads dams, mines, or any other harmful changes. Even this sort of statemen would be an advance, and maybe the countries will do still more.

It is recommended that the attention of Governments should be drawn to the need to adopt the following measures: the reflection, in social and economic policies, of concern for conservation, in particular of the most valuable features of the environment anywhere in their territory (monuments, sites, rural and urban landscapes, interesting ecological settings,

ktor Rousal: BIRDS AND PEAKS

> *threatened species of fauna and flora, high-quality resources of water and open space, etc.) and the launching or continuation of pilot schemes based on participation.*

We suggest that Cabinet Ministers be the first recruits for 'pilo schemes based on participation' – especially Ministers who are pushing industrial growth.

> *Governments should educate their peoples on the value and purposes of protected areas and design means to use parks as an educational tool.*

Governments should first educate themselves! Some of those that talk loudest about protecting nature are the last to do it. Britain, for example

Many nations now have what they call National Parks to ensure this sort of protection, though the Parks in, say, Great Britain are not recognized in other countries as deserving the name, since they have no special legal protection and can be turned into something else whenever a Minister thinks he knows a better use for them – and this is the sort of change that, once made, cannot be reversed. In almost every country that has tried to set aside National Parks, there is an ongoing battle between the Park idea and the interests of miners, dam-builders, loggers, ranchers, road-builders, and others, for few nations have so much land that even a hundredth of it (let alone an eleventh as in England and Wales) can be set aside without creating conflicts of interest. But these land-use conflicts, which the Stockholm delegates will discuss in detail, are only part of a much larger picture that is centred round the conflict between land for farming and land for settlements.

Good land grows concrete

This conflict is most easily seen round big cities, which have often grown up from old market towns. Since market towns are in the middle of rich farming areas, the spread of the cities tends to cover much of the best farmland, and thus as the city grows it becomes harder to feed. The poorer soils are then farmed more extensively, and the soils get poorer. Industry in the cities may spew out wastes that poison the soil

Wynn Bullock : FOREST

over large areas – a pattern familiar from Australia to Chile. And the flooding of people into the cities also means that their wastes cannot be returned to the soil as before, so the water becomes too dirty to drink, diseases spread, and the soil becomes even less fertile.

These trends toward poorer soil operate because the old structure of farming – people raising their own food through an intimate understanding of soil, crops, and water – has been replaced by something more mechanical, more apart from the land. Land is now seen as a physical resource to be exploited. The wrong use of fertilizers, pesticides, machines, grazing animals, irrigation, or crops has changed many fertile areas into deserts. Where are the cities that flourished beneath the deserts of Libya? Where are the gardens of Arabia and Babylon, the rich fields of Egypt, the ancient forests of China, the lake-spotted plains of Mongolia? What happened to the Eden of Greece and Israel, the cypresses and palms of Iraq, the oaks of the Hittite Empire and of Britain? All these and many more have died from man's abuse of the land – an abuse that to this day is making the Sahara Desert move southward by at least a mile a year along an eighteen-hundred-mile front.

Sowing salt

One of man's strongest and most careless tools for abusing land is the long-lived chemicals that man uses to kill the animals that compete for his food. We have shown earlier in this book how pesticides not only make pest problems worse, but also escape and do much harm to living things far from the farms – and of course whether these substances harm man directly is perhaps even less important than whether they harm other forms of life on which all life, including man's, depends. If we keep doing as we now do on farms – that is, raising just a few kinds of crops in a small space – then of course we shall keep having trouble with pests, for trying to grow just a few kinds of crops works against nature's trends, and the insects and fungi will move in to try to right the balance. Rotating our crops may be the answer. But where even this does not work well enough, we need not fight pests with weapons that turn also against the earth.

Harold Null: LALANG GRASS (SUMATRA), WHICH INVADES CLEARED JUNGLES, CAUSES FIRES, AND KILLS SEEDLINGS. FAO Photo.

It is recommended that the Secretary-General ensure that:

research activities in terrestial ecology be encouraged, supported and coördinated through the appropriate agencies, so as to gain adequate knowledge of the inputs, movements, residence times and ecological effects of pollutants identified as critical;

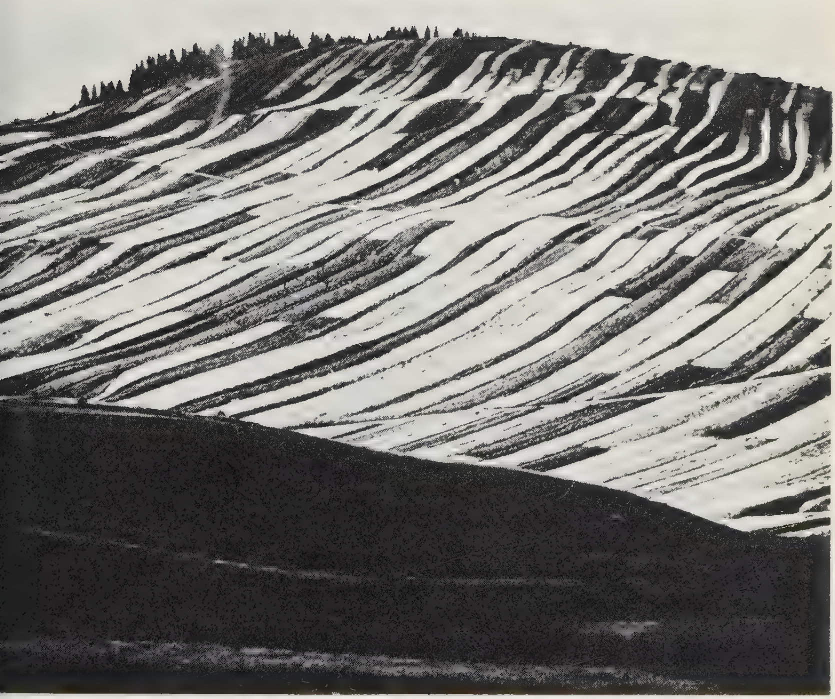
Programmes such as MAB be used to the extent possible to monitor

accumulation of hazardous compounds in biological and abiotic material at representative sites;

the effect of such accumulation on reproductive success and population size of selected species.

Of course we need more research, but we may not get time to finish it if we don't use the knowledge we already have. Nor is it sound to continue adding a pollutant to the earth until monitoring shows that something is going wrong; the danger in this practice is that many global systems are too big to respond quickly. If we stop using DDT today, the peak flow of DDT into the sea won't come for at least another decade! Thus if we keep polluting until something goes wrong, we shall stop too late. Monitoring the damage we have done is not as good as not doing it.

Safer weapons are known. There are, for example, at least three hundred kinds of viruses that prey on certain insects – but only about five of these have been made by industry. These viruses, if very carefully tested and controlled, would probably be a safe method of controlling insects. Another way involves the careful breeding of insects; if, for example, a kind of female insect mates only once, then if large numbers of males bred to be sterile are released, there will be in that area no fertile eggs and, soon, no more insects of that kind. This method has been tried and has worked very well. Still another kind of safe control is the use of special highly selective chemicals to attract certain kinds of insects into traps – no other form of life is affected. Integrated control (a combination of methods like these) has been tried, as in the Cañete Valley in Peru, and it works. And where, as a last resort, we must use pesticides, we can pay more (and help poor countries to pay more) to buy pesticides that break down quickly in nature, so that they do not build up and kill many times as DDT and its relatives can do. In those parts of the world where DDT is still much used to control malaria and



etr. Sikula: STRIP-CROPPING

other diseases, this changing over to less harmful kinds of pesticides is the best solution we can hope for in the next few years, and it must be done now, even if it will cost more. The permanent worldwide damage that DDT and its long-lived relatives could do, especially in the extra-fragile tropics, is too big to measure against such small rises in costs, and may be the price of saving the diversity on which our lives depend.

> *It is recommended that Governments use the best practicable means available to minimize the release to the environment of persistent and toxic substances, particularly heavy metals and organochlorine compounds, until it has been demonstrated that their release will not cause adverse effects or unless their use is essential to human health or food production, in which case appropriate control measures should be applied.*

Unfortunately, everyone who still uses (say) DDT will say its 'use is essential to human health or food production' – 'essential' in the limited sense that substitutes cost more. Since there are no 'appropriate contro measures' except not using the stuff, the UN's task should be to devise subsidies to enable poor countries to afford less harmful substitutes. The rich countries, which have got everyone addicted to pesticides, should stand most of the cost. They should know by now that it isn't worth risking disaster for everyone in order to grow cheaper food for some.

We cannot, however, expect to have our cake and eat it too. We may have to learn to put up with tiny spots on our apples, as our grandfathers did; we may even have to concede small crop losses to insects. It is not easy to admit that perhaps old ways are soundest. A form of tightrope-walking appears in one of the Conference documents, where agricultural scientists have written: 'The dangers inherent in the high-yield grain varieties should be countered by . . . diversifying the crop . . ., by breeding the grains under local conditions for adaptability to local pests and diseases, and by reducing the amount of pesticide required.' These are all a good idea, but you will not end with the carefully bred high-yield grains you started with; you are likely, instead, to have something closer to the native strains that have worked so well for so many millions of years, and thus you will come back close to where you started, raising something very like the crops that nature so carefully designed to be best for that place.

eo Vrana: TREE-FROG

Nor any drop to drink

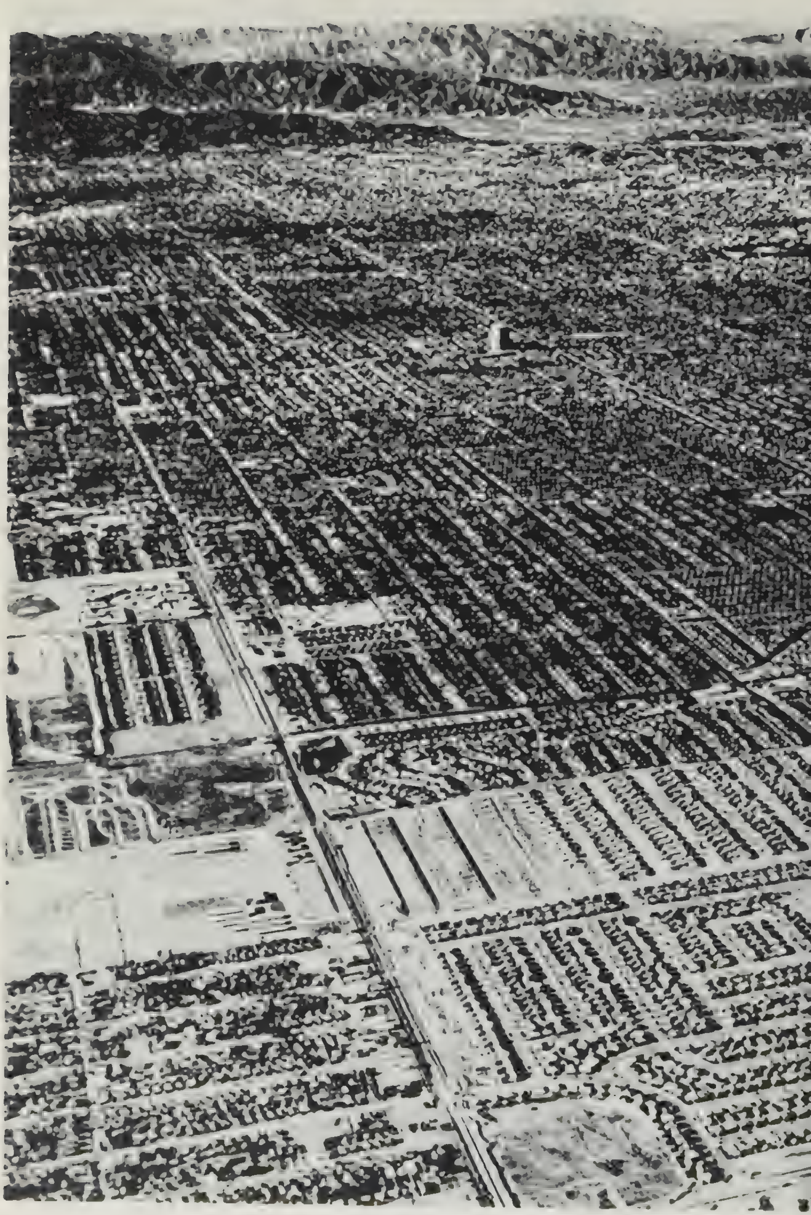
A resource we take for granted as much as the soil and air, and just as essential, is threatened by man's increasing numbers and swelling cities: water, already so scarce that in the poor countries (three-fourths of the world's people), half the people do not have a safe water supply anywhere. Farming and industry now use so much of the world's water – nearly a hundred thousand tons a second – that there is little clean water left. In fact, many areas now live only by mining groundwater, and they are taking it out much faster than nature is putting it back in. Within our lifetimes, many areas that now use wells will simply run dry. This is not far off in many states in the American plains and southwest: states have urged people to move in, whether there was enough water there or not, and these states have then sucked up the groundwater and taken water from other states to try to make good the deficit. For example, the states of the Colorado River Basin have tried to divide between them more river-water than actually exists; California has had plans for sending its water from the mountainous north to the built-up south; some people have even proposed – seriously – digging a canal to bring Yukon water to Texas, or towing down Arctic icebergs to melt for fresh water. This might be funny if they didn't mean it, and if there weren't such a water shortage looming ahead – a shortage caused, in this case, by Americans' wasteful use of water. Similar problems can be found all over the world, often made worse by disease: in the rural parts of the poor countries, only a tenth of the people can get safe water to drink.

Desalting seawater is not the answer: even if we had the energy and know-how to do it, it would be a drop in the bucket. Re-using water seems the only short-term answer, using less water the only long-term answer. Cleaning up our rivers would also help a lot, for many of our cities are built on rivers that are now being used as sewers and therefore cannot yield drinking-water. Many are now too deadly even to wade in;

sel Adams: NEVADA FALL, YOSEMITE NATIONAL PARK some are nearing the state of the world-famous river in Ohio that caugh fire and burned two bridges. The cost of cleaning rivers is high, but nc as high as the costs of not doing so; cleaning up the discharge from paper mill, for example, would not cost even a tenth as much as the plan itself. Cities that get their water not from rivers but from wells, though have no such easy way out, for once disease germs filter down to th water supply, all the city's water will be undrinkable. Some cities, suc as Lagos, may become uninhabitable within ten years for this reason.

Water is only one of the desperate problems of the world's cities, bot rich and poor, both suburb-cushioned and favella-ringed. The story o the cities – a major concern of the Stockholm Conference – is short an terrible. Nearly a third of mankind lives in cities, and the drift into th cities is continuing faster and faster, with city population growing twic as fast as world population. More than a billion people now live i appalling housing, mainly in and around cities; to house the new city dwellers besides will need an extra lot of houses, built in one generation equal to the whole number built in all of human history, and clearl this cannot be done even in rich nations, let alone in poor ones. All ove the world, poor people, eager for change, leave the struggling countrysid and go to the cities, increasing their crowding and misery. The les pleasant a city grows, the more the rich people move away, so the les the city can afford services and the less pleasant it grows: it is a viciou circle that has already gone very far in most of the world. Cities in few countries have mostly avoided uncontrolled growth – as in Canberr (Australia), Rumania, and the USSR – but in most places the problem of cities are so acute and the growth is so fast that the cities are simpl collapsing under their own weight. Growing cities face not only a cycl of rising poverty, but also the 'edge effect', a simple effect of size: as city covers more land, its area increases faster than its boundary does and since the city's wastes must be removed across that boundary, doin this for a given area becomes harder. Thus, as Tokyo got bigger, it policemen found that even if they wore gas-masks they could stay o traffic duty for only two hours, and it was even necessary for oxyge machines to be put into some bars. Tokyo had just become so big an so full of cars that the wind could not blow away the cars' exhaust gase (and the deadlier gases that the sunlight cooked them into) fast enoug to leave breathable air in the city centre!

arold Null: DERELICT LAND, SHAUR RECLAMATION PROJECT, IRAN
FAO Photo



William Garnett : HOUSING DEVELOPMENTS, LOS ANGELES

The poorer the city, the bigger the problem

Of the world's twelve cities of over five million people, eight are in poor countries. The cities of the poor are ringed with bidonvilles, favellas, the shacks and shanties of the desperate. These shanty-towns generally have no water supply, no sewerage system, no public health, no fire protection, no education, no jobs, no taxes, no services of any kind. Their shelters are crowded and do not keep out the weather. Their people are sunk in apathy and hopelessness. Their death-rate is very high, especially among children. This sort of squalor is too horrible for people who have not seen it to imagine. How can it be prevented? Nobody knows a really good answer yet. Part of the problem is purely social and has nothing to do with houses: most people who move from the countryside to the cities are used to living not on income but on lack of expense, and any price is too much for them; they cannot adjust to the way in which cities run on money. Even how to build better shelters is not yet well understood, though we are slowly learning that it is usually better to fix existing shelters than to tear them down and build anew. There are promising experiments, however, going on in many countries. Turkey, Ghana, and Peru are trying the system of giving poor people land and basic services, and letting them build their own houses there. In Togo, houses are being built with skills so simple that everyone can help, and does; it is always best to try to use local skills and materials so that people can earn money to buy food. Venezuela is trying to beat the city problem one step earlier, by building small planned settlements in the countryside to try to persuade people to stay there. But despite these efforts and many more, the crisis of the world's cities is not only far from solved, but is getting worse day by day.

... the allocation of greater financial and other resources to the housing sector so as to preserve what is valuable in the existing housing stock; launch, wherever possible, public housing projects; revitalize city centers; improve transitional settlements; promote mutual help and aided self-help; and provide, where appropriate, 'site and service' facilities to new migrants.

lo Dario Ghezzo : COMUNITÁ

Can it be so simple to house, thirty years from now, three and a ha billion more people than we cannot house now? That works out at ne housing for more than three people a *second* during those thirty years. that rate, we may not have much money left over for other kinds of urge social needs, let alone for flying to the moon.

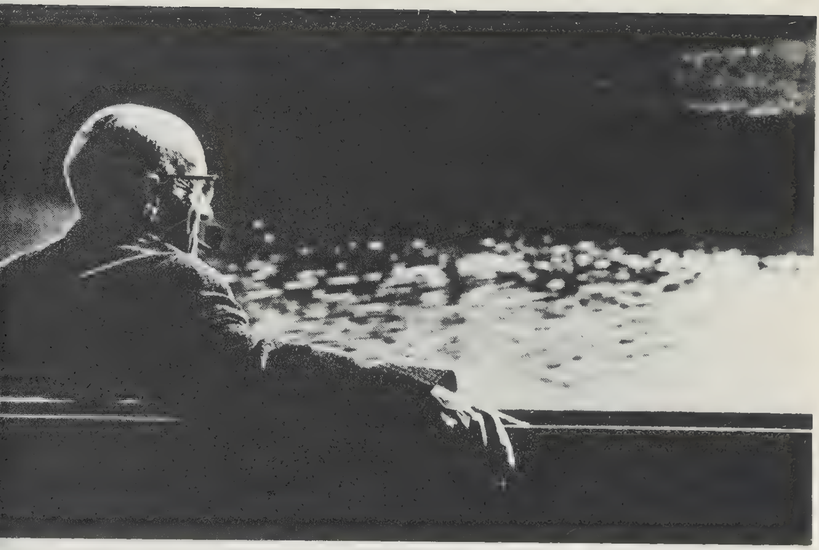
A ton or two of metal for waiting in traffic jams

The cities of the rich suffer from their own special destroyer – th private car, which takes all the room you give it and cries out for mor Yet there must come a point where having more cars means that peop move slower than they would otherwise – that is, the car becomes a anti-transport device. Most of the world's greatest cities passed this poi long ago, and the rest are trying to follow their example. Wherever yo go in a modern city, you will hear and smell cars, and if you are not agi and wary you may feel them too (even the fine and fairly uncrowde roads of the USA see fifty thousand deaths a year). Reducing cars' noi and fumes while doing nothing about their numbers is dishonest an risks finding yourself back at the starting-point in ten or twenty year Of course, whatever way we take out of this problem, we shall have t pay for it; nothing is free, least of all mistakes; but do not think we a not paying for our inaction now. In one way or another, we always pa This is often hard to see because economics – the science of costs sometimes reflects not the reality of the earth, which is the only reali we have, but instead a fantasy-world that takes little account of the futur

> *... the adoption and implementation of a dynamic policy of land us through appropriate incentives and controls designed to prevent lan speculation, ensure the proper location of industries, provide security o tenure in transitional areas, and restrict motor vehicle traffic ....*

It's not entirely clear what 'dynamic' means here, but it all soun worthwhile – especially the last part!

The Stockholm Conference will talk in detail about the problems the world's cities, rich and poor, and of the transport systems that sha



ger de Groof: OLD MAN

them. The greatest need of all cities is for better planning, so tha
governments can control the growth of cities rather than letting it tak
them by surprise as now. But just making plans isn't enough: you hav
to carry them out too, and while you do so you must keep adjusting ther
in the light of what you learn. No country seems to have the secret c
successful planning. Figuring out how to plan better will be one of th
Conference's biggest and most important problems – and the Conferenc
will be the first worldwide attempt to solve it.

The skeleton growing in the cupboard

But while the Conference struggles with these huge problems – citie
water, soils, forests, gene pools, protected land and wildlife, minin
and many more – the biggest problem of all will go undiscussed. Nobod
plans to talk about population. This is nothing new: population has bee
swept under a great many carpets for a long time, and that is why it i
such an overwhelming problem now. The reason the Conference won
discuss population is that a lot of countries won't stand for it – they jus
wouldn't come if population were on the agenda. Some of these countrie
seem to be genuinely convinced that the problem is a fake one, dreame
up by rich countries frightened of poor countries' becoming big an
powerful. Other countries may have more direct political motive
Whatever their reasons, a great many countries – maybe even the majorit
– think that overpopulation is someone else's baby, not their own, and the
refuse to talk about limiting their own growth. This is the hardes
problem in the world, and the most important; and the Conferenc
cannot try to solve it, for if it did try, there would be no Conference a
all to settle simpler questions. This is no fault of the Conference, bu
simply the way many nations now think.

> *In addition, it is recommended that the attention of governments b*
> *drawn to the need for action in the following priority areas:*
>
> *the launching or further development of national population polici*
> *dealing with the growth and distribution of population in relation to th*

ime Giralt : BEACH

role, location and size of human settlements and in keeping with a rational use of resources . . . .

National population policies don't need developing; they just nee reversing. Most countries already have built into their social and legislative structures a policy of encouraging growth, especially in cities. W need equally positive policies aimed in the other direction.

If the present population problem is anyone's fault, the blame shoul probably go to the rich countries, for though their own rates of growt are now low, they made everyone else's high by exporting death-contro technology – modern medicine, farming, transport, and central government – without at the same time exporting birth-control technology They therefore bear a heavy responsibility. The population of India wa fairly stable at a hundred or a hundred fifty million before the Britis arrived; now it is about five hundred twenty million and doubling ever twenty-seven years. The British brought public health, better distributio of food, more powerful farming – but look at the results! Is it reall better to have four times as many hungry people as you had before Is this quite what Britain had in mind? Clearly, just as war is now to important to be left to the generals, so the technology of death contro is too important to be left to the technologists.

Only a few countries, notably Sweden, have attacked world overpopulation sensibly. Most countries have tried solutions that relieve th symptoms while doing nothing about the disease, or perhaps even makin it worse. In 1966, when the USA sent a quarter of its wheat crop t India, did the Americans foresee that people would migrate to the por cities to be nearer the wheat, thus making both city crowding and th shortage of farm labour worse? But this sort of mistake is still bein made all the time. It is not the only mistake. Foreign aid, as it is no practiced by many countries, helps them more than it helps the poo countries the aid is supposed to go to, for it is mainly private investment commercial credit, tied grants, bribes, and loans – everything *but* outrigh grants. Rich countries often say they want poor countries to sell more o their goods – rubber, cocoa, tea, rice, cotton, bananas, copper ore, iro ore, etc. – but then put up tariff walls to keep these goods out, and refus to make agreements that will give the poor countries more stable prices Rich countries, having told poor countries that they are no longe

ernard Flamion: TOWN

colonies or dependencies producing raw materials for the rich countries seem to expect them to change suddenly into something else, to mak riches out of nothing. This cannot be done.

The rich countries try to duck out of their responsibility for the poo countries' population problems by saying that, for example, the death o half a million people in the Bengal tidal waves of 1970 was an 'act o God'. Yet what but the pressure of population made people live in a area they knew was subject to severe storms? Overpopulation kille the Bengal shore-dwellers just as surely as it killed the victims of th Honduras–El Salvador war in 1969. It is no wonder that some of th poor countries think overpopulation is a myth invented to keep them down. If the rich countries expect anyone to accept population control they must show their good faith by taking it up first themselves.

When you've finished this book, there will be 15,000 more people

The let's-not-talk-about-it-because-it-might-embarrass-someone ap proach to population has tinged the world's, and hence the UN's, attitud for a long time. The most the UN has ever got countries to agree on and even that wasn't easy – was the family planning approach, the ide that people who want to have fewer children should be given contra ceptives. This approach is better than none at all, and must be a part o any larger programme, but it simply does not work well enough, fo except in a few countries (of which Britain might perhaps be one), eve if people had exactly the number of children they want, population woul still rise rapidly; we would still be multiplying almost as fast as ever, bu we would be doing it on purpose. 'The things that make family plannin acceptable,' wrote Kingsley Davis, 'are the very things that make i ineffective for population control. By stressing the right of parents t have the number of children they want, it evades the basic question o population policy, which is how to give societies the number of childre they need.' Yet the principle that the size of the family is for the famil alone to decide is now part of the Universal Declaration of Huma Rights, a document of UN consensus. Nobody likes to criticize thi Declaration, which for the most part is admirable, but on this one poi it is more part of the problem than part of the solution. The people wh

Dagmar Hochová : FISHERMEN IN VIETNAM

agreed to it must have had an immense capacity for enduring othe people's suffering.

Figuring out humane ways of controlling population will be far from easy, for it means trading some freedoms for others, and nobody likes t give up any. But it seems plain that if we do not now give up the freedom to breed without limit, we shall end with no freedoms at all. Those wh talk of the 'right' of all possible children to be born seem to have littl idea how the 'right' of those same children to be fed, clothed, housed and educated can be met on a round earth. Perhaps we can find starting-point in the idea that nobody ought to have the power to contro who has children and who doesn't. From that idea it follows tha whatever limits we place on family size must apply to everyone equally Yet nobody has yet devised a method of limiting family size that peopl in a free society can accept – no strict compulsory method, that is. Th nearest we can come up with in a rich country is a system of grade incentives – nobody actually forbids you to have as many children a you like, but it is made very expensive. Of course financial incentives t limit families are not perfectly just, but they seem to be the best w have, and it is certain that we must find some answer quickly. Sinc taxes are supposed to buy services from the State, a simple change in ta structure, making people who (say) have fewer children in future pa less tax, could help a great deal. In poorer countries, the problem i harder, and it is less likely that a simple solution can be found. Education free contraceptives, and free abortions will all help, but a basic chang in customs and social pressures, such as is under way in the People' Republic of China, is just as necessary, for whatever means of birt control are available, people will not use them if they really want to hav more children. Until the small family is the socially done thing and bi families are thought of as irresponsible, families will be big.

It is recommended that the Secretary-General ensure that during th preparations for the 1974 World Population Conference, special attention b given to population concerns as they relate to the environment and, mor particularly, to the environment of human settlements.

By 1974, the world's population will have risen by another seventh of billion. The wait had better be justified by hard action!

Harold Null: EROSION-PRONE TEA PLANTATION, IRAN. FAO Photo

The Stockholm Conference is the first step in a long process of convincing – convincing leaders and, finally, whole nations to think thoughts such as these. The thoughts of most of the world are still very far from running in this direction, though, and the UN cannot speak other than with the voice of most of its members. Yet the UN's having no power but persuasion is itself a kind of advantage. Since it has influence but no political power, the UN doesn't have to try to stay in power as governments do; it can cajole, inform, stimulate, coördinate, see from the outside. As long as it moves slowly enough not to give serious offence to anyone, it can play an important part in moulding the thoughts of nations. Perhaps the new patterns of thought that the Stockholm Conference is to stimulate will help this moulding come about faster, while there is still any time left.

Energy—the problem we all want

To see how hard it is to convince countries to do things they think are against their interests, remember the problem of world energy-use we talked about earlier – a fine case-study for showing all the kinds of problems we face in trying to get nations to work together. You remember that man's use of energy worldwide is growing faster and faster, nearly three times as fast as population; that is, energy-use is doubling every twelve or thirteen years. We have already seen where this leads – plummeting reserves of fossil fuels, huge increases in many kinds of pollution, new dangers from nuclear technology that is still too young to be safe, and the possibility of future changes in the earth's climate. Yet the more people we have, and the more that each person wants, the more energy we need – whereupon we can grow more food, feed more people, and use more energy. Where does this end? Who will have the courage to call a halt?

Those who say this frantic growth must be slowed down or stopped are often told that man has only two choices: either to keep going faster and faster – cars, space-race, Concorde and all – or to leap back into the stone age, dress in skins, and kill woolly mammoths with stone clubs. Conservationists who suggest that man, to show how sensible he is, try using one-tenth less energy each decade rather than three-fourths more, are usually told that they are hysterical, extreme, unscientific, irrespon-

Bernard Gomez: FIELDFARES

sible, unobjective, mediaeval, anti-employment, anti-progress, faddist, and quite silly doom-prophets riding on a bandwaggon without any wheels – and they are told all this by officials (of corporations or governments – it is sometimes hard to tell the difference) who themselves claim to be ardent conservationists. This sort of nonsense arises because those officials have a strong interest in keeping the growth going ever faster, in using up resources faster than anyone else; and they must think that when we run out of things we cannot do without and the whole house of cards falls down, they at least will not be here to see it.

Each nation should set up a national energy board to coördinate energy development and utilization policies, staffed with highly qualified personnel, including some in those disciplines relating to the adverse environmental effects of energy.

• • *Those governments with high per capita use should consider the opportunities for reducing the growth of energy consumption, as one of the alternatives in minimizing all of the costs – direct, environmental and cultural – from economic development.*

Countries should devote special attention to minimizing environmental impacts when siting energy production, conversion and transportation facilities.

Despite best efforts, a finite probability of accidents must remain. For this reason, each nation may wish to set up a pollution crisis centre to deal with accidents.

It is recommended that the Secretary-General take steps to:

Ensure that a study be undertaken on available energy sources and consumption trends in order to plan for and forecast the environmental effects of future use.

These proposals chart an orderly course towards the wrong place. The doubletalk in • • notwithstanding, you cannot have economic growth *and* use less energy; you have to decide which compromise you want. Growth cannot continue; the question is how soon it must stop. Figuring out how to use less energy is going to need a major international research effort; if it is left to private and national initiative, nothing will happen.

Think what would happen if a country, all by itself, decided to pu costly anti-pollution devices on all its power plants, in order to kee

Dimitry Baltermanc : CARIBOU, TSUKOTKA clean the air it passed on to the next breather. Power in that country would then cost more; products made with the power would cost more; the country, far from being rewarded, would suffer in world trade. (Likewise, within countries, companies cannot afford to be clean unless their competitors must be clean too.) Of course, people in the clean-air country would live longer, get emphysema and lung cancer less often, have less washing to do, notice their buildings are lasting longer; but because of the absurd way we run the world, these gains would be of little use to the men put out of work by the loss of foreign trade. This shows why nations must work together to set uniform standards – otherwise industries that cannot stay in a strict country will move to a lax one, as is often done now.

It is recommended that the Secretary-General, in coöperation with governments concerned, take the following steps:

> *A study on the relative costs and benefits of synthetic and natural products serving identical end uses be launched. . . .*

In general, synthetics cost the earth more but pay the makers better. You can therefore expect some industries to resist a move back to natural products, just as they now uphold water-damaging detergent against the better claims of old-fashioned soap.

Less will be better

Now suppose that instead of just covering up the damage done by using too much energy, a country decided to attack the problem head-on by using less energy, by doing more with less. Look at what this country does. It gives up war, advertising, cars, air conditioning, central heating (it spends its oil as plastic foam for insulation, rather than burning it in furnaces), needless packaging. It makes things that last for many years. Its trains store their braking energy rather than wasting it as heat and noise. It stops pouring huge amounts of energy into farming, and goes back to a more natural pattern in which the energy comes from soil and sun as it used to do. It prices its raw materials to show the depletion of reserves, and slows this depletion by re-using everything. It designs its products so that when they finally must be scrapped, the raw materials

orley Baer : RIDGES

can be recovered and sorted out easily. Its people, stable in both numbers and expectations, no longer compete so much with machines, and have more jobs under less pressure. Basic energy needs are cheaply met, but charges for more energy rise rapidly – unlike the present system, where small users help pay for big users through the big users' discount. Both energy and products are priced to show their true cost, rather than hiding the cost in depletion and pollution. Having done all this, the country looks on its works, which are good, and asks the UN what it thinks. And the UN says, as it is bound by its members to do, 'This is all very nice, but you are ahead of your time. You cannot survive in the modern world unless you can convince most of the other countries to do as you are doing. Here is a microphone; start convincing.'

For in the central problem of energy-use, as in so many others, the nations of the world still do not see the limits of the round earth, and think they will find some kind of magic to stretch it indefinitely. There is no such magic. Nobody in government will admit this yet. The Stockholm Conference's action proposals for energy policy – cleaner methods of making and sending it, better planning, more research, better exchange of views – do not say what the earth demands, that is, How can we use less energy? On this question, the proposals say only: 'It is recommended that those governments with sufficient current supply consider the opportunities for reducing the growth of energy consumption. . . .' But who will first cry 'Hold, enough!' when all are claiming a shortage? Nobody will try to use less unless everyone must. With energy growth as with population growth and economic growth – the three main issues that the Conference was unable to meet squarely – only a shift of world opinion, brought about in just a few years, will produce, in time, enough agreement so that countries will be able to talk about reducing growth.

Self-made decisions

In the growth-mad world we have built, new technologies are invented by the same men who decide whether we need them, whether they are good technologies, and how we should control them. There are no opposing experts, no devil's advocates – just those who develop, promote, and control, all in one. Nobody is in charge here: it is like having a ship

Harri Kannosto : EVENING

whose helmsman is closely advised about each shift of the wheel – but not told what port to make for. With control of societies split amongst competing men too clever to have much common sense, it seems as though the whole system were designed by men like the Indian carpenter who, in Arthur Compton's anecdote, botched an easy job by following a simple sketch too closely, and then excused himself by saying, 'But common sense is a gift of God; I have technical knowledge only.' 'Technical knowledge only': will this be man's epitaph? Those men who see what a terrifying choice man faces must persuade others to help make it. The UN Conference on the Human Environment is man's first try at this persuading; and if we do not make a good start now, it may also be his last, for to develop a long-term view, you first need a long term, and this is what we do not have.

Man must now learn the difference between what he can do and what he should do, the difference between movement and progress. By asking not How can we do this? but instead What if we simply didn't? he can make his choices clearer. These choices are hard, and nobody has a monopoly on wisdom – neither rich nor poor, capitalist nor communist, western nor eastern, northern nor southern. The problems we face now are so urgent, so widespread, and so much the same everywhere that perhaps they can for the first time teach man the truth that struck the astronaut Carpenter, who, looking back at the earth gleaming in the midst of space, said, 'All wars are civil wars.' Nobody will buy or sell, love or hate, be rich or poor or black or white or anything at all if we are no longer here.

New goals worth reaching

Perhaps as we come to savour more fully the uniqueness that there is on the third planet from the sun, we shall vie with each other in a new race to see which nation can be the most sensible, which can live most closely in balance with nature. If prizes were awarded now for ecologically sound cultures, they would go to such peoples as the Eskimos, the Bushmen, the Australian aborigines, and the Polynesians – cultures that have survived for thousands of years, and could survive for thousands more if we let them. There is much they can teach us about survival.

rett Weston: WHITE SANDS, NEW MEXICO

Which nation, taking their hint, will be the first to gain the political and moral influence that will follow its announcement that it is stabilizing its growth in numbers and wealth, or better still reducing them to more sensible levels? Which nation will be the first to announce it is seeking a life-style simpler and more satisfying than the Western utopia? Which city (eager, perhaps, for tourists) will be the first to ban cars and put in their place a really good system of cheap public transport? Which country that says it doesn't want American-style wealth will be the first to stop seeking it? Which country will follow Tanzania's choice of necessities over luxuries? Which culture will succeed best in keeping its people on the land (as the People's Republic of China is trying to do) and limited in numbers (as nobody has yet managed to do)? Which nation will follow Cuba's sound policy of building agriculture before industry? Which society will be listed in the yearbook as the 'society most likely to survive'? Which will help most to keep the earth enduringly distinct from the moon? Which will show the most respect for those who may pass this way later, and will leave them the most options? Which will disprove Pogo's saying that we have met the enemy and they are us?

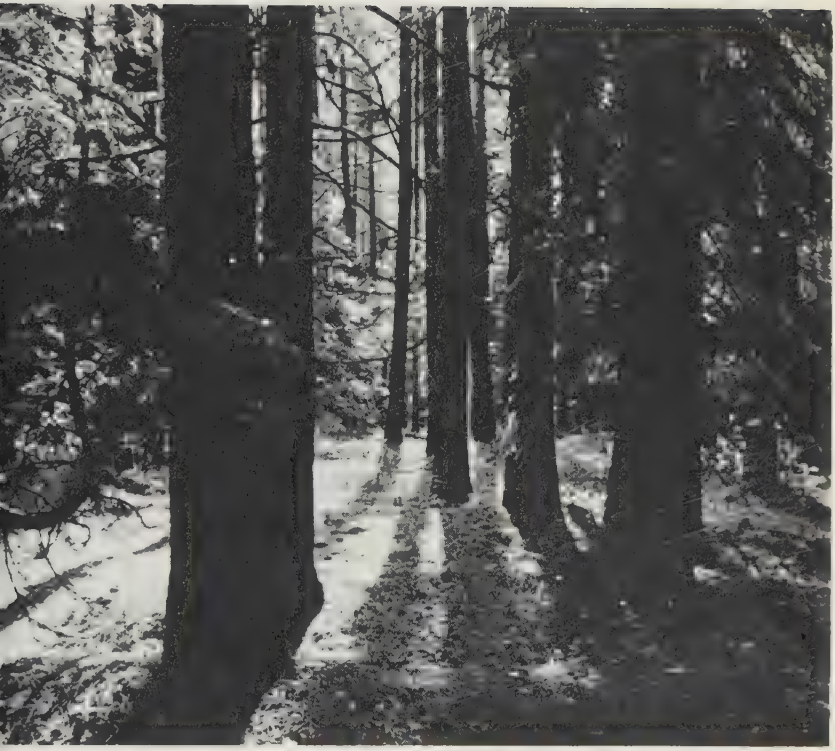
If you're not part of the solution, you're part of the problem

The Stockholm Conference could be the start of a new Renaissance. The old one came with the discovery of new lands to exploit. This new one can come with the discovery of the earth's limits. In what ways a broader concern will grow out of the Conference and continue its work, nobody can predict; but how much the Conference succeeds and lives on will depend most of all on you and on how much you care about your children. On your concern and your action rest the future of the world: for our problems are made and must be solved by governments of people, and people must be heard. Governments do either what you want them to do, or what they think you don't care if they do. Let them know what to do and they will do it: they follow the mood of the country; otherwise they would not be in power. The Stockholm Conference is not about governments; governments come and go, nations change their boundaries, only people are the same. The Stockholm Conference is about people and the earth they live on – and their desire to keep on living there.

Already, public concern is starting to influence governments: the Conference, proposed in 1968 to help arouse public concern, is now far behind the concern that has sprung up in many countries, and the delegates must now catch up. After the Conference, your country's delegates may try to sit back and commend themselves for having solved the world's problems. Don't let them! They've only just begun. Even stronger help and advice for your government, backed by your work and your sweat, can help the good parts of the system beat the bad parts in time, in steps that are orderly, swift, and just. There is no special place you have to go to work for the earth: the earth and its problems are all around you, and they are all that there is. There is only one earth, a last planet, and there is no spare.

We travel together, passengers on a little spaceship,
dependent upon its vulnerable reserves of air and soil,
committed for our safety to its security and peace,
preserved from annihilation only by the care, the work
and, I will say, the love we give our fragile craft.
We cannot maintain it half-fortunate, half-miserable,
half-confident, half-despairing, half-free
in a liberation of resources undreamed of until this day,
half-slave to the ancient enemies of man.
No craft, no crew, can travel safely with such vast
contradictions. On their resolution depends the survival of
us all.

—Adlai Stevenson
Geneva, July 1965



nsel Adams: INCENSE CEDARS, VALLEY FLOOR, YOSEMITE

Appendix I: The Proposed Principles of the Declaration on the Human Environment

1. Man has the fundamental right to adequate conditions of life, in an environment of a quality which permits a life of dignity and well-being, and bears a solemn responsibility to protect and enhance the environment for future generations.

2. The natural resources of the earth, including the air, water, land, flora and fauna, and especially natural ecosystems, must be safeguarded for the benefit of present and future generations through careful planning or management, as appropriate.

3. The capacity of the earth to produce vital renewable resources must be maintained and, wherever practicable, restored or improved.

4. The non-renewable resources of the earth must be employed in such a way as to guard against the danger of their future exhaustion.

5. The discharge of toxic substances, or of other substances in such quantities or concentrations as to exceed the capacity of the environment to render them harmless, must be checked to ensure that serious or irreversible damage is not inflicted upon ecosystems.

6. Economic and social development is essential for ensuring a favourable living and working environment for man and for creating conditions on earth that are necessary for the improvement of the quality of life.

7. Environmental deficiencies generated by the conditions of under-development pose grave problems and can best be remedied by and in the course of development.

8. The environmental policies of all States should enhance and not adversely affect the present or future development potential of developing countries or hamper the attainment of better living conditions for all and appropriate steps should be taken by States and international organizations with a view to reaching agreement on meeting the possible national and international economic consequences resulting from the application of environmental measures.

9. Resources should be made available to preserve and enhance the environment, taking into account the particular requirements of developing countries and any costs which may emanate from their incorporating environmental safeguards into their development planning and the need for making available to them, upon their request, additional international technical and financial assistance for this purpose.

10. Relevant environmental considerations should be integrated with economic and social planning to ensure that development plans are compatible with the need to protect and enhance the environment.

11. Rational planning constitutes an essential tool for reconciling any conflict between the needs of development and the need to protect and enhance the environment.

12. Planning must be applied to human settlements and urbanization with a

view to avoiding adverse effects on the environment and obtaining maximum social, economic, and environmental benefits.

13. Demographic policies, which are without prejudice to basic human rights and which are deemed appropriate by Governments concerned, should be applied in those regions where the rate of population growth or excessive population concentrations are likely to have adverse effects on the environment or development, or where low population density may prevent enhancement of the human environment and impede development.

14. Appropriate national institutions must be entrusted with the task of planning, managing or controlling the environmental resources of States with the view to enhancing environmental quality.

15. Science and technology must be applied to the identification, avoidance and control of environmental risks and the solution of environmental problems, in the furtherance of economic and social development.

16. Education in environmental matters, especially for the younger generations, is essential in order to broaden the basis for an enlightened opinion and responsible conduct by individuals, enterprises and communities in protecting and enhancing the environment.

17. Research and the free exchange and transfer of scientific and other knowledge and experience must be promoted to the fullest extent practicable in order to facilitate the solving of environmental problems taking particularly into account the needs of developing countries.

18. States have, in accordance with the Charter of the United Nations and the principles of international law, the sovereign right to exploit their own resources pursuant to their own environmental policies, and the responsibility to ensure that activities within their jurisidiction or control do not cause damage to the environment of other States or of areas beyond the limits of national jurisdiction.

19. States shall coöperate to develop further the international law regarding liability and compensation in respect of damage which is caused by activities within their jurisdiction or control to the environment of areas beyond their jurisdiction.

20. Relevant information must be supplied by States on activities or developments within their jurisdiction or under their control whenever they believe, or have reason to believe, that such information is needed to avoid the risk of significant adverse effects on the environment in areas beyond their national jurisdiction.

21. Man and his environment must be spared the serious effects of further testing or use in hostilities of weapons, particularly those of mass destruction.

22. Coöperation through international agreements or otherwise is essential to prevent, eliminate or reduce and effectively control adverse environmental effects resulting from activities conducted in all spheres in such a way that due account is taken of the interests of all States.

23. States shall ensure that international organizations play a coördinated, efficient and dynamic role for the protection and enhancement of the environment.

Friends of the Earth

The present environmental crisis is only now being recognized as an ultimate threat to man's survival. We are finally becoming aware that the land, sea, and air on which we depend cannot tolerate the sort of abuse to which they have been subjected.

Action is required now to develop a way of life based on sound ecological principles and related to the limited capacity of the Earth to support the human species. To place our faith in growth of the Gross National Product as a measure of our welfare and happiness, and in technological solutions to all our problems, is proving disastrous to the environment.

It is one thing, though, to lament the tragedy of dying rivers and the curse of industrial dereliction, but quite another to choose an issue, fight the case, and win. Any campaign for a better environment must make sure this is an issue which decides the fate of politicians, activates complacent authorities, or closes factories.

This situation needs new organizations uncompromising in their defence of the environment and uninhibited in the action they are prepared to take.

Friends of the Earth Ltd is one of them. It is an international non-profit-making organization prepared to take aggressive legal and political action to ensure a better environment for everyone. In the UK it is formed as a company limited by guarantee, so as to fight freely and quickly.

We are not just idealists, but we do have ideals. We place emphasis on practical action and we recognize the need for many new organizations to share the work. We are also aware of the need to give more help to existing conservation groups, which have been labouring long and hard. Our Earth is threatened and needs every friend it has.

FOE intends firstly to pursue an active publishing programme with Earth Island Ltd to provide the best possible information, written for the intelligent layman, about the remedial action required to meet current threats to the environment. We intend to encourage further research aimed at a greater understanding of the impact on the Earth of man and his technological society. We shall also urge action now, based on what is already known, to resist the use of a given technology without proof that it will not cause lasting harm.

Unhampered by any party-political allegiance, FOE will undertake substantial legislative activity, including lobbying and focusing public attention on critical issues. We will join other organizations in going to court to fight environmental abuse. We shall wage an all-out war on any interest which ignores the needs of the environment.

FOE's members will form specific task forces supported by teams of environmental experts and citizen's groups. The acronym FOE is appropriate: any friend of the Earth must be the foe of whatever or whoever degrades the Earth.

FOE needs support. It has a growing register of Friends who are prepared to fight authorities and industries insensitive to the ecological effects of their activities. If these goals are yours, contact us.

Friends of the Earth, 9 Poland Street, London W.1. Tel. 01-437 6121.

Friends of the Earth Ltd, a non-profit group founded in September 1970 and registered in May 1971, seeks to conserve, restore, and use rationally the only earth we have. FOE Ltd is not a charity, and is therefore free to lobby, sue, and publish aggressively on a wide range of conservation issues.

FOE Ltd's full-time staff of eight both includes and draws upon professional expertise in science, law, economics, and other fields, and provides a firm research base on which to found lobbying efforts. The main campaigns under way in early 1972 centred round non-returnable bottles and other superfluous packaging, mining in National Parks, planning law, resource policy, energy policy, disclosure of government data on pollution, and banning the importation of products made from endangered animal species. In each case, FOE's focused lobbying is aimed at the enactment of effective laws, supported where necessary by public-interest actions in courts of law.

FOE Ltd has co-published seven paperback books with Pan/Ballantine, and now works closely with Earth Island Ltd in an extensive programme of environmental publishing.

Royalties from FOE's books and profits from Earth Island support FOE Ltd's lobbying efforts – which, however, are financed mainly by private contributions from more than 3000 members.

FOE Ltd is the independent British branch of a network of non-profit conservation groups operating under the same name in many countries. By trading information, co-ordinating campaigns, and pooling talent, FOE groups all over the world can attack regional and global problems beyond the capacity of merely national groups. Despite this co-operation, each FOE sister-organization is run by and for natives of the country concerned.

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